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CONTRIBUTIONS FROM THE LABORATORY
OF THE
MARINE BIOLOGICAL ASSOCIATION OF SAN DIEGO

XVI

THE MARINE FISHES OF SOUTHERN CALIFORNIA

BY
EDWIN CHAPIN STARKS
AND
EARL LEONARD MORRIS

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XIV.

THE MARINE FISHES OF SOUTHERN CALIFORNIA.*

BY
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AND
EARL LEONARD MORRIS.

This paper is based upon the following material: Collections made by the senior author at San Diego during the months from December 20, 1902, to March 15, 1903, and from May 20 to August 15, 1903; by both authors at San Diego and La Jolla during the month from May 18 to June 18, 1905; a small collection made by the junior author during the last week of June, 1905, at Laguna and Newport Bay; and material collected at moderate depths by members of the Marine Biological Association of San Diego during their dredging operations about San Pedro in the summer months of 1901 and 1902, about San Diego during the same months of 1903, 1904, and 1905, including a few fishes collected about San Clemente Island in 1905.

We have endeavored to list all of the fishes that have been recorded on the California coast south of Point Conception within the fifty-fathom line.[1]

* [This paper was originally illustrated by numerous figures. The original drawings, blocks, and first proofs were destroyed in the great fire in San Francisco, April 18, 1906.]

[1] In the genus *Sebastodes* the 50-fathom line has been disregarded, and all of the species known from this region have been listed.

At San Diego Bay headquarters were established at Roseville, and the greater part of the collecting was done within a radius of three or four miles of that point, though nearly all parts of the bay were reached. Collections were made with the aid of fine-meshed seins, fyke nets, and set-lines. A few trips were made with fishermen hand-line fishing to the deep waters outside of the bay, and frequent visits were made to the tide pools on the ocean side of Point Loma, principally to the pools near the outer lighthouse. Owing to our distance from San Diego, it was not found practicable to do much market collecting.

To make the records of distribution of species more dependable, a reference is given to some authority for each record, except when the authors are themselves responsible. In the latter case the species has either been taken at the locality noted or is in the collection of Stanford University. Species having a cosmopolitan distribution are not so treated. In preparing these ranges of species, a series of notes made by Dr. Gilbert, which he has kindly placed in our hands, has been of great assistance, and has added materially to our knowledge of distribution of west-coast fishes.

We wish to thank Dr. C. H. Gilbert for making the trips to San Diego in 1902 and 1903 possible; Dr. W. E. Ritter and Dr. Fred Baker for making the trip of 1905 possible under the auspices of the Marine Biological Association of San Diego; and Dr. Baker especially for his hospitality and much aid in making collections.

Stanford University,
September 15, 1906.

Family BRANCHIOSTOMIDÆ.

1. **Branchiostoma californiense** Gill.

CALIFORNIA LANCELET.

(Jordan and Evermann, 1896, I, p. 4.)

The California lancelet has recently been taken in large numbers near Ballast Point, San Diego Bay, off the Coronado Islands, and in the inner harbor of San Pedro.

Family EPTATRETIDÆ.

2. **Eptatretus stouti** (Lockington).

THE HAG FISH.

(Jordan and Evermann, 1896, I, p. 6.)

This species was commonly taken in deep water off San Diego. It is known northward to Cape Flattery (Gilbert, 1893, p. 395), and is abundant in Monterey Bay. It has not before been recorded at San Diego.

Family HETERODONTIDÆ.

3. **Heterodontus francisci** (Girard).

BULL-HEAD SHARK.

(*Gyropleurodus francisci.* Jordan and Evermann, 1896, I, p. 20, fig. 9.)

This species is rather common south of Point Conception, and was frequently taken in San Diego Bay. The following description is of a specimen 795 millimeters in length, from San Diego:

Width of head equal to space between posterior tip of first dorsal and front of second dorsal. Distance between supraorbital ridges above middle of eyes equal to base of second dorsal. Anterior slope of pectoral exceeding posterior margin of pectoral in length by twice the diameter of orbit. Anterior slope of second dorsal equal to that of ventral or anal. Base of anal equal to that of first dorsal without spine, which forms rather more than half

the base of the latter. Insertion of anal directly below a point midway between posterior end of base and posterior angle of second dorsal. Inner angle of ventral ending directly below front of second dorsal spine. Pectoral when folded back reaching to below posterior tip of first dorsal, or to one diameter of eye of insertion of ventrals. Anterior slope of lower caudal lobe somewhat exceeding posterior margin of caudal below the notch, and equal to the anterior slope of first dorsal. First dorsal spine equal in length to the second, but much stouter. The black spots on body very sparse, not nearly so abundant as in smaller specimens.

In a specimen ten inches long the superciliary ridges extend very much above the interorbital plane, thus making the interorbital space very concave. The spines before the dorsals are covered for three-fourths of their length by the skin. The shagreen spinules are rather sparsely scattered over the skin, leaving smooth interspaces. Larger spinules are irregularly scattered over the body among the smaller ones, being thickest along the back and upper part of sides. On the interorbital space they are definitely arranged in two rows following the inner side of the superciliary ridges. In the newly hatched young the larger spinules only are present. The type of this species came from Monterey, but it is doubtless rare there, as it has not since been noticed.

MEASUREMENTS.

Along median dorsal line:	mm.
From tip of snout to between front of eyes	53
To posterior edge of eyes	16
To between first gill openings	44
To between front of pectorals	25
To front of dorsal	78
To posterior end of dorsal base	70
To posterior tip of dorsal	48
To front of anal	34
To front of second dorsal	89
To posterior end of second dorsal	60
To tip of second dorsal	39
To tip of caudal	240
Total length	795

Family SCYLLIORHINIDÆ.

4. **Catulus uter** Jordan and Gilbert.

SWELL SHARK.

(Jordan and Evermann, 1896, I, p. 25, fig. 12.)

This small shark is common in the Santa Barbara Channel, and is often taken in the traps set for spiny lobsters. It has the peculiar habit of inflating its stomach with air like a globe fish when caught. It has been recorded at Monterey by Jordan and Gilbert (1880, p. 458).

Family CARCHARIIDÆ.

5. **Mustelus californicus** Gill.

DOG SHARK.

(*Galeus californicus* Jordan and Evermann, 1896, I, p. 30.)

This is the commonest shark in Southern California, great numbers being taken in seines and on set-lines in San Diego Bay.

From the 20th of May (the date of our arrival in 1905) to the middle of June, this species was comparatively scarce. Though set-lines were continually used, only thirty specimens were taken, all of which were females. After the latter date, large numbers were taken, the males being well represented.

This species closely resembles *Cynias lunulatus,* of the coast of Lower California and southward. It differs from it in having a shorter, more rounded snout, a less angulated mouth, a more anterior first dorsal, a shorter pectoral, and the apex of the first dorsal more anterior to its posterior tip. The differences of the shorter snout and broader mouth appear much greater than actual measurements indicate.

The distance from the tip of the snout to the insertion of the pectoral is contained from $5\frac{1}{5}$ to $5\frac{3}{5}$ in the entire length to the tip of the caudal in *Mustelus californicus,* while in *Cynias lunulatus* it is from $4\frac{2}{3}$ to $4\frac{3}{4}$. The snout measured obliquely across top of head to eye is contained from 4 to $4\frac{1}{2}$ in distance from tip of snout to first dorsal in the former species; in *C. lunulatus* it is

from 3½ to 3⅔. The distance from the insertion of the ventral to a point vertical from the insertion of the first dorsal is from 6½ to 7⅗ in the body, while in *C. lunulatus* this distance is from 5⅔ to 6⅖. The vertical from the middle of the first dorsal falls nearer the ventral than the pectoral in *M. californicus,* and midway between these points in *C. lunulatus.* The anterior margin of the first dorsal when laid close to the back does not reach the posterior tip of the dorsal by a distance equal to the diameter of the eye. In *C. lunulatus* it does not reach the same point by half the eye.

The male of *M. californicus* has a longer, sharper snout than the female, and the distance between the angles of the mouth is less. Occasionally these sexual differences do not appear, but they are usually very evident. The individual variation in outline of snout is great in both male and female, ranging from a continuous blunt curve to a decided angle, approaching, but not invading, the range of variation of *C. lunulatus.*

The above measurements were drawn from about sixty specimens of *M. californicus,* and five specimens of *C. lunulatus.*

This shark has been noticed as far north as San Francisco by Jordan and Gilbert (1880, p. 458). It is rare northward.

6. **Rhinotriacis henlei** Gill.

(Jordan and Evermann, 1896, I, p. 31.)

This shark has been once taken in San Diego Bay by Dr. C. H. Eigenmann (1892, p. 133). It is apparently more common northward than has hitherto been supposed, as about fifty specimens were recently sent from the San Francisco markets to Stanford University for dissecting purposes. The species has doubtless been passed over as *Mustelus californicus* Gill, which it much resembles. It may be known at once, however, by the sharper, cusp-bearing teeth. It has been recorded at Humboldt Bay by Jordan and Gilbert (1881, p. 31).

The type of the species had probably been born but a short time when collected, as an example taken from the oviduct of one of our specimens is of the same size, 9½ inches in length, and agrees very well with the original description (Gill, 1862*a,* p.

486). In the description of the type the distance from the tip of the snout to the ventrals is given at 33 hundredths of the length. This is evidently a slip of the pen, and should read 43 hundredths.

7. **Triakis semifasciatus** Girard.

THE LITTLE LEOPARD SHARK.

(Jordan and Evermann, 1896, I, p. 31.)

This shark is much more common in the summer than in the winter in San Diego Bay. The following description was taken from a specimen 23 inches in length.

Head 6⅗ in total length; eye 7½ in head, measured obliquely across top of head from tip of snout to first gill opening; cartilage of interorbital space 2¼; width of mouth 3; distance from tip of snout to border of lip 3⅕; distance from front of first dorsal to front of second equal to the distance of first dorsal from tip of snout, or contained 3⅓ times in total length; distance from base of second dorsal to tip of tail 3⅙ in length; dorsal slope of caudal 4⅗.

The ground color is gray or dove color, growing white below; a golden shade follows the middle of side. Back with broad black cross-bars extending down to middle of sides about equal in width to the interspaces. Narrower bars on top of head; one on snout following its contour; a straight one connecting eyes; one connecting posterior corners of eyes; a wider one at nape; a still wider one, as wide as the succeeding ones, opposite insertion of pectorals. One opposite inner posterior angle of pectorals; the next under anterior third or dorsal, running up on fin nearly to its edge, but not connecting with its opposite half. One under posterior end of dorsal involving base of fin; the next above base of ventrals; the next midway between the last and the succeeding one, which is under the anterior end of second dorsal, meeting its opposite half over the edge of fin. One under the posterior end of second dorsal involving base of fin; one opposite tip of anal, and three equally spaced on upper edge of caudal. A series of large spots along lower part of side anterior to ventrals, alternating with the cross-bars. Posterior to the nape there is a spot at the median dorsal line between each bar; one of them at the

anterior end of each dorsal, and one at the base of dorsal. There is a small round spot at the middle of each dorsal, or sometimes two on the first. Two rather indistinct ones on the pectoral; one on the ventral; and two on the lower caudal lobe.

This shark is found northward to San Francisco. It is easily known by its color.

8. **Galeus zyopterus** (Jordan and Gilbert).

SOUP-FIN SHARK.

(*Galeorhinus zyopterus* Jordan and Evermann, 1896, I, p. 32, fig. 15.)

Very abundant on the Southern California coast. The following description is of a specimen 5 feet 4 inches in length.

Head to first gill opening 4½ in length to base of caudal. Width of mouth between outer angles 1 1/10 in distance from mouth to tip of snout. Distance between inner angle of nostrils 2 in same space. Upper labial groove equal in length to long diameter of eye; lower groove three-fifths as long. Tip of lower jaw reaching to below a point half a diameter of eye in front of eye. Eye 4½ in snout; nictitating membrane well developed, capable of entirely closing eye in fresh specimens. Spiracle half a diameter of eye behind eye. Interorbital space from edge of eyelids 1⅛ in snout.

Anterior slope of pectoral greater than posterior slope by three-quarters of the diameter of eye, or contained 2¼ times in the distance from front of pectoral to tip of snout. Tip of pectoral reaching to anterior fourth of base of dorsal. Front of first dorsal equidistant from front of snout and front of second dorsal. Anterior slope of first dorsal equal to distance from tip of snout to middle of eye. Base and posterior slope of first dorsal equal in length, and as long as snout. Anterior and posterior slope of second dorsal about equal, and contained 2⅙ in snout. Front of ventral nearer to base of first dorsal than to base of second by a distance contained 3 times in length of snout. Length of caudal along upper margin contained 4 9/10 in entire length to tip of caudal; lower caudal lobe along anterior margin equal in length to snout and eye. Ventral and anal opposite to each other, the

latter somewhat smaller. Fourth gill opening above anterior part of pectoral. No black on fins.

This specimen had 28 eggs, 14 in each oviduct, each about 4 inches long and covered with a thin brownish membrane.

This shark is found in abundance northward to San Francisco (Jordan and Gilbert, 1880, p. 458). It reaches a length of 6 feet, and is of some value for the oil which its liver yields, but more particularly for its fins, from which the Chinese make a finely flavored soup, the cartilaginous fin-rays dissolving into a nutritious gelatine. Most of the fins on the market are used by Chinese in the United States, but some of them are shipped to China.

9. **Prionace glauca** (Linnæus).

BLUE SHARK.

(Jordan and Evermann, 1896, I, p. 33, fig. 16.)

Recorded from San Diego by Eigenmann (1892, p. 133). Not seen by us. The blue shark is occasionally taken on our coast. It is abundant in tropical seas, and not uncommon in British waters. It reaches a length of 15 to 20 feet, and shares with most large sharks the reputation of being a man-eater.

10. **Carcharias lamiella** Jordan and Gilbert.

BAY SHARK.

(Jordan and Evermann, 1896, I, p. 37.)

San Diego Bay is the type locality of this shark, where it is a rare species. It is the only species of *Carcharias* occurring on our coast. Dr. Jordan has a photograph of this shark from Avalon, Santa Catalina Island.

Family SPHYRINIDÆ.

11. **Sphyrna zygaena** Linnæus.

THE HAMMER-HEADED SHARK.

(Jordan and Evermann, 1896, I, p. 45.)

Occasionally taken south of Point Conception. A mounted specimen seen that was taken off Point Loma. It is of cosmopolitan distribution, being found in all warm seas. It reaches a length of 15 feet.

Family ALOPIIDÆ.

12. **Alopias vulpes** (Gmelin).

THE THRESHER SHARK.

(Jordan and Evermann, 1896, I, p. 45, fig. 20.)

Not uncommon on the Southern California coast. It is found in all warm seas.

Family SQUALIDÆ.

13. **Squalus sucklii** (Girard).

THE DOG FISH.

(Jordan and Evermann, 1896, I, p. 54.)

Reported by the fishermen to be rather abundant in deep water a few miles from the mouth of San Diego Bay. Unlike specimens from the north, it is unknown from the bays or shallow water. Two specimens secured. It is found northward to Bering Island (Jordan and Gilbert, 1899, p. 434), and is very abundant north of San Francisco.

Family SQUATINIDÆ.

14. **Squatina squatina** (Linnæus).

THE ANGEL SHARK.

(Jordan and Evermann, 1896, p. 58.)

Not uncommon; specimens frequently seen moving slowly over the bottom apparently in search of food. It is widely distributed over all warm seas, and is found northward to San Francisco on our coast.

Family RHINOBATIDÆ.

15. **Rhinobatus productus** Ayres.

GUITAR FISH.

(Jordan and Evermann, 1896, I, p. 63.)

This species is very abundant in rather shallow water. Large numbers were taken in San Diego Bay. The following description was drawn from a male specimen 35 inches in length:

Width of snout at front of eyes equal to distance from tip of snout to between posterior edge of spiracles, or three times interspiracle width. Interorbital cartilage contained 4¼ times in same distance. Rostral ridges running parallel and rather close together along their anterior half. Width of mouth contained 2 1/10 in distance from tip of snout to between anterior edge of nostrils. Least width between nostrils 4⅘ in same distance. Width of body at posterior angle of pectorals equal to distance from tip of snout to margin of orbit. Distance across pectorals 1¾ in distance from tip of snout to first dorsal. Anterior slant of dorsals equal, and contained 1¾ in snout to posterior edge of spiracles. Very conspicuous lateral folds along lower side of body. Claspers reaching nearly to opposite front of first dorsal. Shagreen at tip of snout, around front of orbit, and posterior inner edge of spiracles enlarged and polished. A narrow band of irregular spines along back, and a small bunch of humeral spines. No spines on rostral ridges. Larger specimens are somewhat broader.

Small specimens of about a foot in length have the spines on the back larger and sharper, and in addition have spines along the rostral ridges, and around the inner and anterior borders of the eye. A wide flat digitate flap is present on the upper surface of the tip of the snout in the young of both sexes, up to 15 or 16 inches in length. A female specimen 22 inches long has the rostral flap nearly absorbed, only the fringed posterior edge remaining; the rostral ridges are coarsely roughened. The position of the flap is marked in the adult of all ages by a transverse slit at the tip of the snout.

We may here call attention to the following mistakes occurring in the description by Jordan and Evermann. The rostral ridges are nowhere confluent, but are parallel along their anterior half. The rostral flap is not confined to the female, but is equally developed in the young of both sexes. The black spot under the tip of the snout is seldom present in the adult, but is nearly always in the young.

This species is found from San Francisco (Jordan and Gilbert, 1880, p. 458) to San Diego.

MEASUREMENTS.

Along median dorsal line:	mm.
From tip of snout to between front of eyes	120
To posterior edge of spiracles	35
To tips of posterior pectoral lobes	185
To tips of ventral lobes	115
To front of first dorsal	45
To posterior tip of first dorsal	65
To front of second dorsal	100
To posterior tip of second dorsal	65
To tip of caudal	185
Total length	915

16. **Zapteryx exasperatus** (Jordan and Gilbert).

(Jordan and Evermann, 1896, I, p. 64.)

San Diego Bay is the type locality of this ray. The male specimens are reported by Eigenmann (1892, p. 134) to be abundant in the bay, though it was not seen by us; female specimens have never been taken.

17. **Platyrhinoides triseriatus** (Jordan and Gilbert).

(Jordan and Evermann, 1896, I, p. 65.)

One specimen taken at Newport Bay. It is said to be common, though it was not taken by us at San Diego. Recorded from San Francisco by Jordan and Gilbert (1880, p. 458).

Family RAJIDÆ.

18. **Raja rhina** Jordan and Gilbert.

THE SHARP-NOSED RAY.

(Jordan and Evermann, 1896, I, p. 72.)

A male specimen 40 inches in entire length was taken on the banks off Point Loma, and was reported by the fishermen to be not very rare. This is the first time this ray has been reported south of Monterey Bay.

Anterior edge of pectoral undulating; concave to opposite eye, where it is convex, thence concave to tip of snout. Tip of snout very acute; its width, a distance from its tip equal to width of interorbital space, is contained 1⅖ in interorbital space. Diam-

eter of ball of eye 7⅘ in snout in median line, and slightly greater than length of spiracle. Interorbital space 4 in length of snout; interspiracle space 3. Distance between inner angles of mouth contained 2⅓ in distance from mouth to tip of snout; distance between nostrils contained 2⅗ in same space. A line drawn between outer angles of pectorals exactly bisects a median longitudinal line reaching from tips of ventrals to a point midway between tip of snout and middle of eyes. Length of tail from inner angle of ventrals is contained 3 times in entire length. Distance from front of anterior dorsal to tip of tail, contained 6⅗ times in distance from anterior dorsal to tip of snout. The stellated area on snout extends to posterior edge of spiracles, and behind each spiracle is a small patch; the stellæ coarser anteriorly. A group of strong spines extending around front of eye and back on supraorbital ridge to opposite posterior edge of spiracle. These are very irregular in size and position, and can not be exactly counted, but there are at least 20 of them (from 5 to 7, Jordan and Evermann, I, p. 72). A group of spines on median line of back a short distance behind spiracles and in front of humeral arch. A median line of strong spines on tail, beginning opposite posterior edge of pectorals (not ventrals, as stated by J. and E). Smaller spines scattered irregularly over the surface of the tail,, and interspaced with still smaller ones. Edges of pectorals with small spines; larger and more close set along anterior edges. A wide stellated area on median line of back behind humeral arch. Bases of pectorals and median part of back perfectly smooth. The ocellated spot of the young on the base of the pectoral represented by a dusky diffused blotch.

This species is found northward to Vancouver Island (Jordan and Gilbert, 1881, p. 34).

19. **Raja inornata** Jordan and Gilbert.

COMMON SKATE.

(Jordan and Evermann, 1896, I, p. 73.)

Recorded southward to Santa Barbara. Fishermen report a skate frequently taken on the banks off Point Loma, having a shorter snout than *Raja rhina,* possibly this species. It is known north to San Francisco.

Family DASYATIDÆ.

20. **Urolophus halleri** Cooper.

THE ROUND STING RAY.

(Jordan and Evermann, 1896, I, p. 80.)

The commonest sting ray of San Diego Bay. They are a great pest to fishermen working in the bay, as they cut nets and lines and much time is wasted in disentangling them from seines. Fishermen never fail to kill them when caught, though their numbers doubtless make them one of the most valuable scavengers.

A couple of embryos nearly three inches long taken from the oviduct of an adult, have a conspicuous flap extending back from the eye and the upper edge of the spiracle and ending in a rather long free point behind.

Some specimens are dark brown on the entire upper surface, profusely spotted with clear-cut, round, light yellow dots, smaller than a pin head, which are indistinctly ringed with brown darker than the body color. Other specimens (the more usual coloration) have the spots more indistinct, blended, and many of them run together, making short reticulated marks. Still other specimens are uniform slaty brown above, without a trace of spots. Sometimes specimens have large, light, blended spots, as large in diameter as the combined length of the eye and spiracle, and with or without the small spots. Ventral surface white medially, growing orange or red towards edge of fins and on caudal peduncle. Extreme edge of fins and lower surface of caudal peduncle sometimes light brown, and with or without small, light spots. Known from Santa Barbara (Jordan and Gilbert, 1880, p. 457) southward probably to Panama (Gilbert and Starks, 1904, p. 15).

21. **Dasyatis dipterura** Jordan and Gilbert.

THE RAT-TAILED RAY.

(Jordan and Evermann, 1896, I, p. 85.)

This species is not uncommon, though taken by us less frequently than any other of the sting rays. The smaller specimens are perfectly smooth; a specimen 29 inches in length had four

spines along the median dorsal line, but no humeral or other spine. A specimen 37 inches in length had a single small spine at the upper end of each humeral arch, and 8 similar spines in front of them, occupying a space as long as spiracle. The width of the disk was equal to its length from tip of snout to end of ventral fins. It is recorded only from San Diego.

22. **Pteroplatea marmorata** Cooper.

THE CALIFORNIA BUTTERFLY RAY.

(Jordan and Evermann, 1896, I, p. 87.)

This sting ray is very common on the warm, shallow tide flats. The following description was drawn from a specimen 22 inches in length.

Width from vertebral ridge to outer angle of pectoral equal to length of body from front of eyes to posterior edges of pectorals. Distance along anterior margin of disk from tip of snout to outer angle of pectoral equal to distance from tip of snout to posterior end of ventrals. Interorbital space equal to length of snout; diameter of eye 3½ in interorbital space. Width of mouth equal to distance between outer angles of nostrils, and slightly greater than interorbital space. From tip of snout to mouth 3½ in distance from mouth to vent. Length of ventral from posterior angle of pectoral equal to width of interorbital space. Length of tail equal to length of snout and eye; sting inserted opposite posterior end of ventrals.

Color in life: Dark brown everywhere, mottled with small light drab spots and reticulated lines. Belly and front of under parts white; pectorals yellow, covered with dark reticulations. Under side of tail and claspers and posterior half of ventrals clear warm yellow.

The outer angle of pectorals moves farther forward with age. In a specimen 4 feet wide, a line drawn between the outer angles of pectorals crosses the median dorsal line at a point midway between the posterior edge of the ventrals and the front of the eyes. In a specimen 22½ inches wide, this line falls midway between the edge of the ventrals and the posterior edge of the spiracles. In a specimen 12 inches wide it is midway between the ventrals

and a point behind the spiracles, a distance equal to one diameter of the eye. In a specimen 6½ inches wide the line crosses at a point midway between the edge of the ventrals and a point behind the spiracles, a distance equal to three times the diameter of the eye.

Known from Santa Barbara (Jordan and Gilbert, 1880, p. 457) to San Bartolomé Bay, Lower California.

MEASUREMENTS.

Along median dorsal line:	mm.
From tip of snout to between front of eyes	113
To between posterior of eyes	20
To between posterior part of spiracles	32
To inner angle of pectorals	475
To tip of ventrals	90
To tip of spine	25
To tip of tail	55
Total length	810
Along median dorsal line:	mm.
From tip of snout to mouth	120
To vent	500
To tip of ventrals	110
To tip of tail	80
Interorbital width	120
Interspiracle width	110
Entire width	1400

Family AËTOBATIDÆ.

23. **Aetobatus californicus** Gill.

BAT-FISH.

(*Myliobatus californicus* Jordan and Evermann, 1896, I, p. 89.)

Very abundant on the shallow mud-flats. On two occasions in the early summer adult females gave birth to young during their struggles after they had been caught and thrown on the beach. Five were born to one, and six to the other. They resembled the adults in nearly all proportions, except that the tail was longer. They were each about 9 inches in width, and the umbilical cord was wholly absorbed. This ray is found northward to San Francisco (Jordan and Gilbert, 1880, p. 457).

MEASUREMENTS.

Along median dorsal line:	mm.
From tip of snout to between front of eyes	65
To between posterior edge of eyes	29
To posterior edge of spiracles	41
To posterior angle of pectoral	290
To tip of pectoral	57
To front of dorsal	32
To end of dorsal	28
To base of caudal spine	15
To tip of spine	62
To tip of tail	365
Total length	984

Width of disk, 766 mm.; interspiracle width, 102; length of ventral from inner angle of pectoral, 115; tip of snout to edge of upper lip, 63; width of mouth (upper lip), 52.

Family CHIMÆRIDÆ.

24. **Chimaera colliei** Lay and Bennett.

THE RAT FISH.

(*Hydrolagus colliei* Jordan and Evermann, 1896, I, p. 95, fig. 41.)

This species is not uncommon a few miles off shore from the mouth of San Diego Bay. It has not before been recorded this far south. Unlike examples from the north, it is unknown from the bays or shallow water. The San Diego Natural History Society has several specimens preserved. It is known northward to Puget Sound (Jordan and Starks, 1895, p. 789).

Family MURAENIDÆ.

25. **Rabula aquae-dulcis** (Cope).

(Jordan and Evermann, 1896, I, p. 390.)

A specimen in the U. S. National Museum said to have been taken at San Diego by Dr. J. G. Cooper. This is probably an error in labeling. The only other known specimen is the type from Costa Rica.

26. **Gymnothorax mordax** (Ayres).

CONGER EEL.

(*Lycodonlis mordax* Jordan and Evermann, 1896, I, p. 395).

Common; frequently brought in by the fishermen. Specimens taken in rock pools at La Jolla. Fresh specimens have the tip of

the tail bright orange or scarlet, and the head a lighter brown than the body. This eel reaches a length of 5 feet, and is found in abundance south of Point Conception. Its flesh is fat, resembling that of the common fresh-water eel of the eastern United States, and when fried is said to be very palatable.

Family ELOPIDÆ.

27. **Albula vulpes** (Linnæus).

THE LADY FISH.

(Jordan and Evermann, 1896, I, p. 411, fig. 179.)

Several larval and young specimens, from 2 to 5 inches long, taken at San Diego from May 15 to June 15. Fishermen report the occasional capture of an adult specimen in the bay. Two specimens 15 inches in length, recently taken in sardine nets by fishermen in Monterey Bay, and secured by Mr. F. A. Woodworth, extends the northern range of this species. It is almost universally distributed throughout warm seas, and is abundant in Hawaii and Japan. It reaches a length of 3 feet and is said to be a food fish of good quality.

Family CLUPEIDÆ.

28. **Etrumeus micropus** (Schlegel).

(*Perkinsia othonops* Jordan and Evermann, 1896, p. 420).

The type of *Perkinsia othonops* Eigenmann, taken at San Diego, is the only specimen known from America. It is not uncommon in Japanese waters.

29. **Clupea pallasii** Cuvier and Valenciennes.

HERRING.

(Jordan and Evermann, 1896, I, p. 422, fig. 186).

The herring is known in abundance from Bering Sea to San Diego. It is abundant in the Bay of San Diego in the winter time, spawning about January. It reaches a length of about 18 inches.

30. **Sardinella caeruleus** (Girard).

CALIFORNIA SARDINE.

(*Clupanodon cæruleus* Jordan and Evermann, 1896, I, p. 423.)

Abundant on the Southern California coast, and valued chiefly as bait, though an excellent food fish. Specimens in our collection agree with the original description in having 19 dorsal rays, not 14 as stated by Jordan and Evermann. It is less than a foot in length, and is found northward to Puget Sound (Jordan and Starks, 1880, p. 790), and southward to Cerros Island.

Family ENGRAULIDÆ.

31. **Anchovia compressa** (Girard).

(*Stolephorus compressus* Jordan and Evermann, 1896, I, p. 447.)

This species is very abundant in San Diego Bay. The anal has 31 or 32 rays, which agrees with the description by Jordan and Evermann, but is less than the number given by Girard (1858, p. 336) for the typical specimens (anal, 2, 35–1).

Anchovia compressa differs from *A. panamensis* and *A. mundeola* in having a shorter head, a longer maxillary, and more gill rakers on upper limb of branchial arch. *A. compressa* has from 20 to 22, *A. panamensis* from 16 to 18, and *A. mundeola* 16 to 20.

This anchovy is found from Santa Barbara to the Gulf of California (Gilbert, MS. notes), and reaches a length of 5 or 6 inches.

32. **Anchovia delicatissima** (Girard).

(*Stolephorus compressus* Jordan and Evermann, 1896, I, p. 444.)

Equally abundant with *Anchovia compressa,* but far surpassing that species as a food fish in the richness and delicacy of its flesh. It may be at once known by its plumper, less compressed body, and narrower silvery lateral band. Specimens taken at Newport Bay and San Diego. Its southern range is not known.

33. **Engraulis mordax** Girard.

CALIFORNIA ANCHOVY.

(Jordan and Evermann, 1896, I, p. 448.)

Specimens from San Diego, and from Albatross stations 4324 and 4498 shows a wide range of variation. The head is contained

from 3 to 3¾ times in the length of the base of the caudal, the maxillary from 4¼ to 5⅔ times in the same distance, and the eye from 4 to 4½ times in the head. The dorsal has 14 or 15 rays, occasionally as many as 18; the anal has from 21 to 23.

Contrary to statements in current descriptions, specimens in alcohol, especially those that have lost their scales, show a very distinct silvery lateral band.

This is the largest and most valuable as a food fish of our anchovies, reaching a length of 7 inches, and extending its range northward to Puget Sound.

Family SYNODONTIDÆ.

34. **Synodus lucioceps** (Ayres).

LIZARD FISH.

(Jordan and Evermann, 1896, I, p. 539.)

This species is represented in the collection by two adult specimens from San Pedro, and a young one from San Diego.

In our specimens the lower jaw is not longer than the upper as stated by Ayres (1855, p. 69); they otherwise agree in essential respects with the original description.

In the young specimen, 1¼ inches in length, dark plates are present beneath the skin on the ventral side of the body, arranged as follows: One pair at edge of shoulder girdle, another pair midway between pectorals and ventrals, and five pairs between ventrals and vent. A dark line of pigment spots at base of caudal, and a few similar spots along middle of sides posteriorly.

This species reaches a length of 18 inches and ranges north to San Francisco (Jordan and Gilbert, 1880, 475). It is not uncommon, but is seldom brought to market.

Family MYCTOPHIDÆ.

35. **Macrostoma angustidens** Risso.

(Jordan and Evermann, 1896, I, p. 555.)

Known on our coast only from Cortez Banks. It is known from the Atlantic and Indian oceans, and Mediterranean Sea. Probably more than one specimen is confused under this name, and further study will modify this range.

36. **Lampanyctus townsendi** (Eigenmann and Eigenmann).

(Jordan and Evermann, 1896, I, p. 558.)

Known from Cortez Banks; the type was taken at a depth of 45 fathoms.

37. **Nannobrachium leucopsarum** (Eigenmann and Eigenmann).

(Jordan and Evermann, 1896, I, p. 562.)

This species is found rather abundantly in deep water from Alaska (Gilbert, 1893, p. 399) to San Diego. Eigenmann (1892, p. 142) reports it to be one of the most abundant Myctophids off Point Loma, especially during stormy weather, when it may be found in the stomachs of rockfish.

38. **Diaphus theta** Eigenmann and Eigenmann.

(Jordan and Evermann, 1896, I, p. 564.)

This species is known from the coast of Washington (Gilbert, 1893, p. 399) to San Diego (the type locality) in deep water.

39. **Myctophum californiense** Eigenmann and Eigenmann.

(Jordan and Evermann, 1896, I, p. 572.)

Cortez Banks; known only from the types.

40. **Tarletonbeania crenularis** (Jordan and Gilbert).

(Jordan and Evermann, 1896, I, p. 575.)

This specimen is known only from two specimens, one taken from the stomach of an albacore in the Santa Barbara Channel (the type), the other blown on the deck of a vessel on the coast of Washington during a storm (Jordan and Evermann, *l. c.*).

41. **Tarletonbeania tenua** Eigenmann and Eigenmann.

(Jordan and Evermann, 1896, I, p. 575, fig. 248.)

Known only from the type from the stomach of *Sebastodes miniatus* taken near the Coronado Islands.

Family PLAGYODONTIDÆ.

42. **Plagyodus ferox** (Lowe).

(*Alepisaurus æsculapius,* Jordan and Evermann, 1896, I, p. 595, fig. 258.)

A specimen 48 inches in length in the collection of the San Diego Natural History Society.

Head 5¾ in length to base of caudal; depth at occiput equal to length of snout. Eye between adipose eyelids 6½ in head; snout to edge of adipose eyelid 2⅓; maxillary 1⅖; mandible 1⅓; interorbital space 2¼ in snout; dorsal 37; anal about 16 (some rays missing); ventral 11, counting a very short first ray.

Snout pointed; jaws equal. Maxillary not free, the skin of side of head continuous over it; it ends at corner of mouth, which is one diameter of pupil distant from preopercular ridge. All teeth inclined backward; 2 enlarged teeth at front of mandible on each side; the anterior one a little more than half the size of the other. Behind them 4 or 5 small sharp canines, their length about a third of diameter of pupil; then 2 or 3 (2 on one side, 3 on the other) stout, sharp canines, which are the largest in the lower jaw, their length nearly half the diameter of eye; following are 11 short, triangular teeth like the teeth of a saw; their posterior edges nearly verticle, their anterior edges oblique. Premaxillary with a row of very small sharp canines anteriorly, which grow gradually much smaller posteriorly. No vomerine teeth. A large canine on palatine situated under a point half way between tip of snout and front of eye; a larger similar one under a point at posterior seventh of snout; behind them a toothless space back to below anterior orbital rim, followed by 8 or 10 saw-like teeth similar to those on lower jaw. Skin of side of head in front of preorbital ridge thin, smooth, and without ridges or wrinkles.

A line of pores runs down across cheek from top of head, turning forward beneath eye and running half way to tip of snout. Opercle and subopercle with sharp conspicuous ridges, radiating from points at their anterior edges, a faint indication of striæ following posterior outline of bones. Mandible with similar ridges diverging backward from a point at tip of dentary,

and forward from a point at posterior end of articular. Gill rakers sharp and single pointed on anterior part of lower limb of arch; double on posterior part, and on upper limb of arch; their number 6 + 19; branchiostegals 7.

Only a few of the dorsal spines are entire; the fourth is $1\frac{1}{10}$ in head; the tenth is $1\frac{1}{4}$; the seventeenth $1\frac{1}{4}$; and the thirtieth 2. Base of adipose dorsal equal to diameter of eye; its height slightly exceeds the length of its base; its distance from upper caudal rays is contained $1\frac{1}{4}$ in head. Origin of anal from base of lower caudal rays exceeds the length of the head by one diameter of the eye. Pectoral sharply pointed posteriorly; its length $1\frac{1}{4}$ in head; its rays much divided, 13 in number. Ventrals reaching slightly past vent; their length $3\frac{1}{10}$ in head; caudal deeply forked. Vent midway between tip of mandible and base of median caudal rays.

Color, dark brown on back, creamy brown on sides, running to white below. Head almost entirely silvery. A conspicuous dark brown streak along lateral line. Dorsal and adipose dorsal uniform dark brown; pectorals silvery, slaty black at tips, their inner surface brown; ventrals brown; caudal lobes brown toward tips; anal silvery.

This species is known northward to Unalaska (the type locality of *Plagyodus æsculapius*) and in deep waters of the Atlantic. Most of the specimens known have been cast ashore by storms.

Family PARALEPIDIDÆ.

43. **Sudis ringens** Jordan and Gilbert.

(Jordan and Evermann, 1896, I, p. 600.)

"Santa Barbara Channel, California, the only specimen known taken from the stomach of a hake (*Merluccius*), itself found in the stomach of a long-finned albacore (*Germo alalunga*)." (Jordan and Evermann, *l. c.*)

Family PŒCILIIDÆ.

44. **Fundulus parvipinnis** Girard.

(Jordan and Evermann, 1896, I, p. 640.)

Very abundant on the Southern California coast, especially

in San Diego Bay. Known southward to Magdalena Bay, Lower California (Gilbert, MS. notes).

Loving the warm shallow water of the sand beaches, they may be seen in small schools on bright sunny days in San Diego Bay, so close to the shore that their backs appear above the water, and the little waves frequently roll them high and dry on the sand, from which they quickly struggle into the water again.

Family BELONIDÆ.

45. **Tylosurus exilis** (Girard).

NEEDLE FISH.

(Jordan and Evermann, 1896, I, p. 714.)

Common on the Southern California coast. The following description of color was taken from a fresh specimen.

Back clear Venetian green, with a distinct narrow lateral band of darker green, having bluish reflections running back just above base of pectoral, and becoming indistinct posteriorly. Sides and lower parts bright silvery, with lilac and violet reflections. Pectorals slightly dusky; ventrals white; anal white except a pinkish area on first one or two rays. Dorsal a delicate but conspicuous blue, its anterior lobe tipped with pinkish red; median rays of caudal blue, the lobes pinkish red toward tips.

This species reaches a length of 3 feet, and is common from Point Conception south to Guaymas, Mexico.

Family HEMIRAMPHIDÆ.

46. **Hyporhamphus rosae** (Jordan and Gilbert).

HALFBEAK.

(Jordan and Evermann, 1896, I, p. 721.)

Rather common in San Diego Bay; the largest specimen taken was 7½ inches long. It is found southward along the Lower California coast to Guaymas, Mexico (Evermann and Jenkins, 1891, p. 135).

Family SCOMBRESOCIDÆ.

47. **Cololabis brevirostris** (Peters).

(Jordan and Evermann, 1896, I, p. 726.)

The adult of this species has been very rarely taken on the California coast. It occurs northward to Tomales Bay (the type locality), though the young has been recently found in abundance by the U. S. S. Albatross. It is very close to, if not identified with, *Coloabis saira*, a species occasionally found in large schools in Japan. Recorded from San Diego by Eigenmann (1892, p. 143).

Family AULORHYNCHIDÆ.

48. **Aulorhynchus flavidus** Gill.

(Jordan and Evermann, 1896, I, p. 754.)

This species is known on the Southern California coast only from San Nicholas Island (Gilbert, MS. notes). Its range extends northward to Sitka, Alaska (Bean, 1881, p. 240).

Family EXOCŒTIDÆ.

49. **Cypselurus californicus** Cooper.

THE GREAT FLYING FISH.

(*Exocœtus californicus* Jordan and Evermann, 1896, I, p. 740, fig. 319.)

Two large specimens were preserved from off San Pedro. It is very abundant about the Santa Barbara and Coronado Islands. It disappears in winter and it is not known where it goes, as it has not been reported outside of California. It is probably the largest of the flying fishes, and the only one on our coast. It is said to be an excellent food fish.

Family SYNGNATHIDÆ.

50. **Syngnathus californiensis** Storer.

GREAT PIPE FISH.

(*Siphostoma californiensis,* Jordan and Evermann, 1896, I, p. 764.)

Two specimens were taken at San Pedro. It is known northward to Puget Sound (Jordan and Starks, 1895, p. 797), and

southward to San Bartolome Bay, Lower California (Gilbert, MS. notes). It has a longer dorsal than other Southern California pipe fishes; 39 to 46 on 1 + 9 rings.

51. **Syngnathus punctipinnis** (Gill).

(*Siphostoma punctipinne* Jordan and Evermann, 1896, I, p. 763).

Known only from the types taken at San Diego in 1862.

52. **Syngnathus leptorhynchus** Girard.

THE COMMON PIPE FISH.

(*Siphostoma leptorhynchus,* Jordan and Evermann, 1896, I, p. 764.)

Exceedingly abundant; several hundred were taken at one haul of the seine from among the ell-grass at low tide near the head of San Diego Bay, and specimens were taken in all parts of the bay at nearly every seine haul.

In January nearly all the brood-pouches were full of eggs in an advanced state of incubation; a very few were empty. At the middle of May some brood-pouches contained eggs, some contained young with the yolk sack still attached, and many contained young that were probably about ready to be expelled; so it is probable that the breeding season is extended over a large part of the year. This species is abundant northward to San Francisco Bay.

53. **Syngnathus auliscus** (Swain).

PIPEFISH.

(*Siphostoma auliscus,* Jordan and Evermann, 1896, I, p. 767.)

This species is generally distributed in San Diego Bay, but is not so common in salt water as *Syngnathus leptorhynchus.* In the sloughs which receive fresh water, however, it is apparently more common.

Specimens from San Diego and San Pedro agree fairly well with the description of the typical specimens (Swain 1882, p. 310), but show a greater degree of variation. The head is contained from 9 to 9¼ in the entire length without caudal; the dorsal has from 29 to 33 rays, and extends over 1 + 6, or 0 + 7,

or 1 + 7 rings; there are 14 or 15 body rings, and from 37 to 41 caudal rings (the ring containing the vent counted as a caudal ring); the caudal pouch covers from 20 to 24 rings.

This species differs from *Syngnathus leptorhynchus* in having the angles of the body sharper, the head shorter, the snout shorter, and with a more prominent median keel, the caudal pouch longer, and the body rings fewer. In the latter species the head is contained from 6½ to 8½ times in the length without caudal; the body rings number from 16 to 19; and the brood-pouch covers 19 to 20 rings.

It is known southward to Panama (Gilbert and Starks, 1904, p. 57); taken in Magdalena Bay (Gilbert MS. notes) and the Gulf of California.

54. **Syngnathus barbarae** (Swain).

(*Siphostoma barbaræ*, Jordan and Evermann, 1896, I, p. 765).

Only the type from Santa Barbara known.

55. **Syngnathus arctus** (Jenkins and Evermann).

SHORT-NOSED PIPEFISH.

(*Siphostoma arctum*, Jordan and Evermann, 1896, I, p. 771.)

Three specimens seined in San Diego Bay, and two taken in tide pools at La Jolla. They are the first that have been seen since the type was taken in the Gulf of California in 1888. The species has been erroneously recorded from Mazatlan (Jordan, 1895, p. 416).

Our specimens agree in all respects with the type which has been kindly loaned us by the U. S. National Museum.

The following color description was made from a male and a female specimen from San Diego Bay: Color, brown; a double row of dark spots along side back to vent; one on each plate. Belly ridge of female black; ridges on each side of pouch of male black. Ventral side of head anterior to a white transverse streak just behind eye marked with fine irregular cross streaks of white and brown in the female, with white dots in the male. At each angle behind vent, between each plate is a white dot (this is not evident in alcoholic specimens).

Specimens from La Jolla very much darker—almost black; under side of head blackish and without cross streaks.

MEASUREMENTS IN HUNDREDTHS OF LENGTH TO BASE OF CAUDAL.

	Type. Guaymas, Mexico.	LaJolla, Cal.		San Diego Bay.		
Length to base of caudal in mm.	89	77	82	85	74	58
Head in one-hundredths of length	9¼	10	9	9	9	10
Depth	4½	4½	4	4	4½	4
Length of snout	3½	3	3	3	3	2¾
Diameter of eye	2	2½	2¼	2	2¼	2½
Tip of snout to front of dorsal	35	34	33	32	34	35
Tip of snout to vent	34	33	34	33	33	35
Base of dorsal	8	9½	8	10	9½	9

56. **Hippocampus ingens** Girard.

CABALLITO DEL MAR.

(Jordan and Evermann, 1896, I, p. 776.)

San Diego is the type locality of this species, where it is very rare; not seen by us. It is found southward to Cape San Lucas (Gill, 1862, p. 282), and is one of the largest of the sea-horses, reaching a length of nearly a foot.

Family ATHERINIDÆ.

57. **Leuresthes tenuis** (Ayres).

(Jordan and Evermann, 1896, I, p. 802.)

Specimens taken in January and August at San Diego, the reported end and beginning of its residence in the bay. Its range extends northward to San Francisco (its type locality), where it is apparently rare.

58. **Atherinopsis californiensis** Girard.

PESCADO DEL RAY; "SMELT."

(Jordan and Evermann, 1896, I, p. 806, fig. 341.)

Common in San Diego Bay in January, when many large specimens were seined on the sandy beaches. It is said by Dr. Eigenmann (1892, p. 145) to enter the bay at the last of August

and remain till February. This and other Atherinoid fishes are unforunately almost universally known in southern California as smelt,—a fish they resemble only in being slender and silvery. It ranges northward to San Francisco.

59. **Atherinops affinis** (Ayres).

PESCADILLO DEL REY.

(Jordan and Evermann, 1896, I, p. 807, p. 342.)

This species was found in abundance in San Diego Bay from December to August, and unlike the other Atherinoid fishes it is said to be common in the bay all the year. It has been taken as far south as Magdalena Bay, Lower California (Gilbert, MS notes). It is known northward to San Francisco (type locality), and is abundant throughout its range.

60. **Atherinops insularum** Gilbert.

(Jordan and Evermann, I, 1896, p. 807.)

This is a species apparently confined to the islands from the Santa Barbara Islands to Guadalupe Island, replacing *Atherinops affinis* of the mainland.

It has fewer spines in the dorsal (5) than *Atherinops affinis,* finer scales (from 62 to 68), and a larger space between the dorsals. Dr. Gilbert (MS. notes) has records of its occurrence at the following localities: San Nicholas Island, Santa Cruz Island, San Clemente Island, Cerros Island, and Guadalupe Island.

Family MUGILIDÆ.

61. **Mugil cephalus** Linnæus.

MULLET.

(Jordan and Evermann, 1896, I, p. 811, fig. 343.)

Not uncommon in San Diego Bay, especially abundant in a brackish slough near Old Town. It is cosmopolitan in distribution.

Family SPHYRÆNIDÆ.

62. **Sphyraena argentea** Girard.

BARRACUDA.

(Jordan and Evermann, 1896, I, p. 826.)

Abundant in the open ocean, and the young are common in the bays in the spring-time. It is found from San Francisco to Guaymas, Mexico (Evermann and Jenkins, 1891, p. 137), and is a food fish of importance, especially southward.

Family POLYNEMIDÆ.

63. **Polydactylus opercularis** (Gill).

THREAD FISH.

(Jordan and Evermann, 1896, I, p. 830.)

Mrs. Andrews, an artist in San Diego, who has a large collection of oil studies and paintings of fishes, has a color study of what is apparently this species; she obtained two specimens from the fishermen. It has not before been recorded so far north; its range extends southward to Panama.

Family SCOMBRIDÆ.

64. **Scomber japonicus** Houttuyn.

MACKEREL.

(*Scomber colias* Jordan and Evermann, 1896, I, p. 866, fig 364.)

Very abundant on the Southern California coast. It is cosmopolitan in distribution, being known on both coasts of America northward to Maine and San Francisco, Japan, England, and the Mediterranean. It is a food fish of importance, but very inferior to the common mackerel of the east coast.

65. **Gymnosarda pelamis** (Linnaeus).

OCEANIC BONITO.

(Jordan and Evermann, 1896, I, p. 868.)

Mrs. Andrews, an artist in San Diego, has an oil-color study of this species. She secured the specimen in the local market. It

is a pelagic species found in most warm seas. On the Atlantic coast it has been taken as far north as Cape Cod, but it has not been recorded north of San Diego on the Pacific coast.

66. **Thunnus thynnus** (Linnaeus).

TUNNY; TUNA.

(Jordan and Evermann, 1896, I, p. 870.)

Rather abundant about the Santa Barbara Islands. It is a pelagic species found in all warm seas, and known northward on our coast as far as San Francisco. It is the largest of the bony fishes, reaching a weight of 1,500 pounds, though none of that size have ever been recorded on our coast. In the Santa Barbara Islands it is considered the king of game fishes, but it is unknown to anglers elsewhere. It is known as the Tunny on the Atlantic coast, and as the Tuna on our coast and in the Mediterranean.

67. **Germo alalunga** (Gmelin).

LONG-FINNED ALBACORE.

(Jordan and Evermann, 1896, I, p. 871, fig. 367.)

Abundant; a pelagic species widely distributed in warm and tropical seas, and found northward on our coast as far as San Francisco (Jordan and Gilbert, 1881, p. 45). It is very abundant about the Santa Barbara Islands, but is a food fish of little value, as its flesh is coarse.

68. **Germo macropterus** (Schlegel).

YELLOW-FIN ALBACORE.

Specimens have been in the last two years occasionally taken off Avalon. It is common in southern Japan and is occasionally taken about Hawaii. From *Germo alalunga* this species is known by the citron yellow finlets, and by the high soft dorsal and anal. (Jordan and Starks, 1906.)

69. **Sarda chilensis** Cuvier and Valenciennes.

BONITO.

(Jordan and Evermann, 1896, I, p. 872.)

Very abundant off Point Loma; ranging from Chili to Puget Sound. It is here recorded from the latter locality for the first

time, specimens having been taken in the winter of 1899 by the senior author. Eighteen gill rakers are attributed to the horizontal limb of the first branchial arch by Jordan and Evermann. They also describe the maxillary as not reaching the eye. There are eight or nine gill rakers, and the maxillary extends to the posterior border of the eye.

70. **Scomberomorus sierra** Jordan and Starks.

SPANISH MACKEREL.

(Jordan and Evermann, 1896, I, p. 874.)

Recorded by Eigenmann (1889, p. 126) from Cortez Banks under the name of *Scomberomorus maculatus.* It is known southward to Panama and the Galapagos Islands (Snodgrass and Heller, 1905, p. 361). Jordan and Evermann (1896, I, p. 874), under the description of *Scomberomorus maculatus,* state that the species is found on both coasts of North America. If *S. sierra* is a distinct species *S. maculatus* is confined to the Atlantic coast.

Family XIPHIIDÆ.

71. **Xiphias gladius** Linnæus.

COMMON SWORDFISH.

(Jordan and Evermann, 1896, I, p. 894.)

The fishermen at San Diego report this fish to be common in the summer time in the open sea. A specimen twelve feet in length was taken by the fishermen and put on exhibition in San Diego. Permission was obtained to describe it as it lay, but the anal and under parts could not be examined. It had been eviscerated and the depth much decreased.

Head from tip of mandible 4 in length to tips of middle caudal rays; sword from nostril 2¼. Width of sword opposite tip of mandible 2⅗ in post orbital part of head; at middle of sword ⅘ of diameter of eye. Mandible to posterior angle of mouth 3½ times diameter of eye. Eye 2⅔ in postorbital part of head. Interorbital space 11 in length to tips of middle caudal rays. Caudal keels very wide, the distance across them 5¾ in same distance; upper caudal lobe 5½; pectoral 4⅓. Height of anterior

dorsal slightly exceeds postorbital part of head and eye; that of posterior dorsal 4/5 of diameter of eye. Dorsal rays (not counting the rays enveloped in skin) 16–5.

The swordfish is widely distributed in the Atlantic, and is known on our Pacific coast north to the Santa Barbara Islands.

Family ISTIOPHORIDÆ.

72. **Tetrapterus mitsukurii** Jordan and Snyder.

THE MARLIN-SPIKE FISH.

(Jordan and Snyder, 1901, p. 304.)

This species is occasionally taken off Santa Catalina Island (Jordan and Starks, 1906). A specimen 12 feet long is on record at Avalon.

Family LEIDOPIDÆ.

73. **Lepidopus xanthusi** Goode and Bean.

(Jordan and Evermann, addenda III, 1898, p. 2843. The genus, 1896, I, p. 886.)

An adult specimen, 30 inches in length, has recently been taken at Avalon, Santa Catalina Island by Dr. C. F. Holder. (Jordan and Starks, 1906.) It is the first adult specimen collected, being previously known from two very small specimens taken at Cape San Lucas.

Family REGALECIDÆ.

74. **Regalecus russelli** (Shaw).

(Jordan, 1905, II, p. 472.)

A specimen recorded from Newport 22 feet in length, and others from Santa Catalina Island (Jordan and Starks, 1906).

Family CARANGIDÆ.

75. **Naucrates ductor** Linnæus.

PILOT-FISH.

(Jordan and Evermann, 1896, I, p. 900.)

A specimen of the pilot-fish recently recorded from off Santa Catalina Island (Jordan and Starks, 1906). It is a pelagic species widely distributed in all warm seas.

76. **Seriola dorsalis** (Gill).

YELLOW-TAIL.

(Jordan and Evermann, 1896, I, p. 902, fig. 380.)

Abundant on the Southern California coast. Known from Cape San Lucas (type locality) northward to the Santa Barbara Islands, where it is an important species.

77. **Caranx caballus** (Günther).

(Jordan and Evermann, 1896, I, p. 921.)

This species was recorded from San Diego by Girard (1858, p. 108), but it has not since been seen so far north. It is found southward to Panama and the Galapagos Islands (Snodgrass and Heller, 1905, p. 364).

78. **Trachurus picturata** (Bowdich).

HORSE MACKEREL.

(Jordan and Evermann, 1896, I, p. 909.)

Specimens taken in San Diego Bay. This species is of wide but peculiar distribution. It is known from Monterey to San Diego, from the Galapagos Islands to Chili, and New Zealand, but not from the west coast of Mexico and Central America. It is known from the Mediterranean, but not from the east coast of North or South America. It seems probable that further study will prove that more than one species is included in this range.

Family LUVARIDÆ.

79. **Luvarus imperialis** Day.

This species is recently recorded from off Catalina Island. (Jordan and Starks, 1906.) It is a widely distributed pelagic species.

Family LAMPRIDÆ.

80. **Lampris regia** (Bonnaterre).

OPAH; MOONFISH.

(*Lampris luna* Jordan and Evermann, 1896, I, p. 954.)

Mrs. Andrews of San Diego has a painting of this species from a specimen caught in the vicinity. It is a pelagic species cos-

mopolitan in distribution. There are two skins of the Opah at Avalon.

Family BRAMIDÆ.

81. **Brama raii** (Bloch).

POMFRET.

(Jordan and Evermann, 1896, I, p. 959.)

This species has been several times taken on the Southern California coast. A specimen seen from Santa Catalina Island. It is pelagic and widely distributed. On our coast it has been taken north to Vancouver Island (Jordan and Starks, 1895, p. 797). It has been commonly taken in Monterey Bay.

Family STROMATEIDÆ.

82. **Peprilus simillimus** (Ayres).

CALIFORNIA POMPANO.

(*Rhombus simillimus,* Jordan and Evermann, 1896, I, p. 967.)

Reported to be abundant at times, but not valued highly as at San Francisco. One small specimen seen at San Diego. This species is known northward to Puget Sound (specimens taken by Starks in 1899).

Family ICOSTEIDÆ.

83. **Schedophilus heathii** Gilbert.

(Gilbert, 1904, p. 260, pl. XXVI.)

One specimen 3½ inches in length taken at San Pedro. It is the second specimen known and resembles the type in all essential respects. Like the type, it was taken at the surface in company with a jelly-fish.

Family SERRANIDÆ.

84. **Sterolepis gigas** Ayres.

JEWFISH.

(Jordan and Evermann, 1896, I, p. 1137.)

Often abundant in deep water, especially about the Coronado Islands. The flesh is cured in brine and commands a high price. It is known northward to Monterey (Jordan and Gilbert. 1880. p. 456).

85. **Paralabrax nebulifer** (Girard).

JOHNNY VERDE.

(Jordan and Evermann, 1896, I, p. 1195.)

Not rare in San Diego Bay, though less common than *Paralabrax maculatofasciatus.* It may be known by the presence of small, round, dark spots confined to the head and caudal peduncle. It resembles *Paralabrax maculatofasciatus,* and differs from *Paralabrax clathratus* in its elongate third dorsal spine; its wide preorbital bone, which is equal in width to the diameter of eye; and its more rounded dorsal outline of head and snout.

All of the specimens examined by us have the second anal spine shorter than the third; not "as long as third," as stated in current descriptions.

Color in life: cheek and suborbital region with many small, round, golden, or yellowish brown spots. Ground color of back solid green to under middle of soft dorsal; behind this point the back and sides are reticuled with white. Under parts pure white. Three oblique, dusky bands under spinous dorsal, extending downward and backward across sides to belly. A wider, shorter, more vertical one under anterior third of soft dorsal, and the beginning of another just behind it; these extending a short distance up on soft dorsal. Dorsal and pectoral light transparent green; spinous dorsal dusky in front; upper part of caudal dark green, changing to blue below; ventral and anal a rather bright slaty blue.

The young are lighter than the adults, and have large, light spots on sides. The dark color along base of dorsal gradually extends down the sides with age.

It is known northward to Monterey (Jordan and Gilbert, 1880, p. 456), southward to Ascension Island, Lower California (Jordan and Gilbert, 1881*a,* p. 278).

86. **Paralabrax maculatofasciatus** (Steindachner).

SPOTTED CABRILIA.

(Jordan and Evermann, 1896, I, p. 1196, fig. 198.)

This is probably the commonest species of its genus in San Diego Bay. It may be readily known by its numerous dark

brown spots covering almost the entire body. It differs from *Paralabrax nebulifer* in having the scales on top of head extending forward to opposite middle of eyes instead of to opposite front of eyes as in the latter species.

The statement by Jordan and Evermann that the lower jaw does not project so far as in *Paralabrax nebulifer* is not true of any of the many specimens examined by us.

A specimen 19 inches in length has the third spine of the dorsal reaching to the base of the second ray of the soft dorsal.

This species is known from San Pedro (Jordan and Gilbert, 1880, p. 456), south to Mazatlan, Mexico (Jordan, 1895, p. 45).

87. **Paralabrax clathratus** (Girard).

CABRILLA.

(Jordan and Evermann, 1896, I, p. 1197.)

Though Dr. Eigenmann (1892, p. 150) reports the adult of this species to be "rarely if ever seen in the bay" (San Diego), we took several large specimens on set-lines at Roseville, finding it about as common as *Paralabrax nebulifer*. It may at once be known from other species of *Paralabrax* by the absence of small round spots on the body, in having the third, fourth, and fifth dorsal spines about equal in length, and the preorbital narrow, its width less than half that of the eye. The statement by Jordan and Evermann that the second anal spine is longer than the third is not true of any of our specimens, where it is equal to or shorter than the third.

The following color description was taken from a fresh specimen 19 inches in length:

Steel gray on lower half of sides; the scales along the middle of body dark on posterior edges. Back coal black with light areas indicating cross bars arranged as follows: a light spot under anterior dorsal rays; a wide light bar under middle of soft dorsal; and one under posterior end of soft dorsal. Sides and lower part of head yellowish; fins all tinged with yellow.

Small specimens from four to five inches in length are reddish brown on sides and back, with longitudinal rows of oblong, bluish, silvery spots forming broken streaks. A row on back fol-

lowing contour of lateral line; a row along lateral line; and a row running straight below lateral line from tip of opercular flap to middle of caudal peduncle, joining posteriorly the row along lateral line. Belly and lower parts silvery. An oblique red streak downward and backward across opercle and in front of pectoral base; another from eye turning downward and following edge of preopercle to its angle, and thence across subopercle; a short faint one across cheek to preopercular ridge, and one running backward from end of maxillary. Spinous dorsal reddish brown, with large, blended, transparent spots. Anal and caudal uniform reddish brown; pectoral yellowish and transparent; ventral orange, black at tip, its inner ray white.

This species is known from San Francisco to Todos Santos Bay, Lower California (Jordan and McGregor, 1898, p. 278).

Family LUTIANIDÆ.

88. **Xenistius californiensis** (Steindachner).

(Jordan and Evermann, 1898, II, p. 1286.)

Reported to be sometimes abundant about San Diego; not seen by us. Known southward to Guaymas in the Gulf of California (Evermann and Jenkins, 1891, p. 144).

Family HÆMULIDÆ.

89. **Anisotremus davidsoni** (Steindachner).

SARGO RAIADO.

(Jordan and Evermann, 1898, II, p. 1321.)

Reported to be not rare about San Diego in the summer time (Eigenmann, 1892, p. 152); not seen by us. It is known to range from San Pedro (Jordan and Gilbert, 1880, p. 456) to San Bartolome Bay, Lower California.

Family GERRIDÆ.

90. **Eucinostomus californiensis** (Gill).

(Jordan and Evermann, 1898, II, p. 1369.)

Once taken at San Diego by Dr. Eigenmann (1892, p. 154); known southward to Guayaquil, Ecuador (Starks, 1906, p. 792).

Family KYPHOSIDÆ.

91. **Medialuna californiensis** (Steindachner).

MEDIALUNA.

(Jordan and Evermann, 1898, II, p. 1391, fig. 560.)

Common on the coast of Southern California about rocky places; one specimen taken at La Jolla. Not seen in San Diego Bay. Known from Santa Barbara (Jordan and Gilbert, 1880, p. 456) south to Cerros Island (Jordan and McGregor, 1898, p. 279).

92. **Girella nigricans** (Ayres).

GREEN FISH.

(Jordan and Evermann, 1898, II, p. 1382.)

The young up to ten inches in length are very abundant in the tide pools.

Color in life olive green with bright blue borders to the fins and membrane following the gill opening. The blue follows the edge of the dorsal across the tips of the spines and rays, but follows the rays longitudinally on the upper and lower edges of the caudal and on the front of the anal. The ventrals are tipped with blue; the pectorals are yellowish. There is a very conspicuous light spot on the back below the middle of the base of the dorsal. It is not at all constant in position, one being frequently behind the other on opposite sides of the same fish. Sometimes there are two spots on each side, and occasionally two on one side and one on the other. When the fish has been dead a short time the blue color on the fins entirely disappears, and the spot on the side is not very conspicuous.

Known from San Francisco south to Guaymas, Mexico (Evermann and Jenkins, 1891, p. 154).

Family SCIAENIDÆ.

93. **Cyanoscion nobilis** (Ayres).

WHITE SEA BASS.

(Jordan and Evermann, 1898, II, p. 1413.)

An important food fish. Many specimens seen at Santa Barbara, and an occasional one from off Point Loma. It is known

from Victoria (Jordan and Evermann, *l. c.*) south to the Gulf of California, where it was taken by the U. S. S. Albatross (Station 3026); probably rare north of San Francisco.

94. **Cynoscion parvipinnis** Ayres.

(Jordan and Evermann, 1898, II, p. 1410.)

Reported to be sometimes common on the Southern California coast. A specimen seen from San Diego. It is known from San Pedro (Jordan and Gilbert, 1880, p. 456) south to Guaymas, Mexico (Evermann and Jenkins, 1891, p. 159).

95. **Seriphus politus** Ayres.

QUEENFISH; WHITE CROAKER.

(Jordan and Evermann, 1898, II, p. 1397.)

Common in San Diego Bay. Known northward to San Francisco (Jordan and Gilbert, 1880, p. 456).

96. **Sciaena saturna** (Girard).

BLACK CROAKER.

(Jordan and Evermann, 1898, II, p. 456.)

One specimen 12½ inches long from San Diego Bay. There are 70 scales in the lateral line (55 to 60 in current descriptions). We may here call attention to a mistake in the description of this species by Jordan and Evermann. The caudal in the beginning of the description is said to be lunate, as it is in our specimen, but further on in the same description it is again described as "caudal fin slightly convex, its middle rays longest."

This species is known from Santa Barbara (Jordan and Gilbert, 1880, p. 456) south to the Gulf of California (Albatross Station 3026, Gilbert, MS. notes).

97. **Roncador stearnsi** (Steindachner).

RANCADOR.

(Jordan and Evermann, 1898, II, p. 1457, fig. 568.)

This species was taken in abundance in San Diego Bay during the latter part of July, though it was not seen before that time. It may at once be known by a conspicuous black spot at the base

of the pectoral. Known northward to San Francisco, where a specimen was collected in the market by Dr. Jordan. It has not before been recorded north of Santa Barbara.

98. **Genyonemus lineatus** (Ayres).

KINGFISH.

(Jordan and Evermann, 1898, II, p. 1460.)

Several specimens were taken at San Pedro. The young from one and one-half to three inches in length differ from the adults in having a rather strong spine at the angle of the preopercle, with a weaker one above and below. The oblique dark stripes are absent, but there are about twelve wide, dark, vertical bars on side of body and head, which often extend on to the back.

It is known from San Francisco southward to Todos Santos Bay (Jordan and McGregor, 1898, p. 279).

99. **Umbrina roncador** Jordan and Gilbert.

YELLOW-TAILED CROAKER.

(Jordan and Evermann, 1898, II, p. 1467.)

This species was very common about San Diego Bay in July and August, though it was not seen early in the year. Known south to Pesqueña Bay, Lower California (the type locality), and north to San Francisco. Here recorded from the latter locality for the first time from a specimen collected in the market by Dr. Jordan.

100. **Menticirrhus undulatus** (Girard).

CALIFORNIA WHITING.

(Jordan and Evermann, 1898, II, p. 1476, fig. 570.)

A specimen 16 inches in length, taken in San Diego Bay, differs from current descriptions in the following proportions: Head $4\frac{2}{5}$ in body to base of caudal; depth 5. Eye 8 in head, 3 in snout, 2 in interorbital space. Highest dorsal spine $1\frac{3}{5}$ in head. Tips of dorsal spines when reclined reach to dorsal rays.

Known southward to the head of the Gulf of California (Gilbert, MS. notes) and northward to Santa Barbara (Jordan and Gilbert, 1880, p. 456).

Family EMBIOTOCIDÆ.

101. **Abeona minima** (Gibbons).

(Jordan and Evermann, 1898, II, p. 1497, fig. 578.)

Numerous specimens taken on Point Loma and at La Jolla in tide pools. Known from San Francisco (Jordan and Gilbert, 1880, p. 456) southward to Todos Santos Bay (Jordan and McGregor, 1898, p. 281). It has also been taken from San Nicholas, Santa Cruz, and San Martin Islands (Gilbert, MS. notes). It is the smallest member of the family, and is not uncommon.

102. **Cymatogaster aggregatus** Gibbons.

VIVIPAROUS PERCH.

(Jordan and Evermann, 1898, p. 1498, figs. 579, 579*a*.)

This is the most abundant surf-fish in San Diego Bay, a haul of the seine seldom failing to bring in some of them. This species is known northward to Fort Wrangle, Alaska (Bean, 1884, p. 361). It is the northernmost species of the family. It is everywhere abundant south of Puget Sound.

103. **Brachyistius frenatus** Gill.

(Jordan and Evermann, 1898, II, p. 1499, fig. 580.)

Apparently rare on the Southern California coast; not seen by us. Known from Puget Sound (Jordan and Starks, 1895, p. 797) southward to Guadalupe Island, Lower California (Jordan and McGregor, 1897, p. 281).

104. **Zalembius rosaceus** (Jordan and Gilbert).

(Jordan and Evermann, 1898, II, p. 1500.)

Specimens taken off San Diego and other points off Southern California (Gilbert, MS. notes) extend the range of this species southward. It is found north to San Francisco (type locality).

105. **Hyperprosopon argenteus** Gibbons.

WALL-EYED SURF-FISH.

(Jordan and Evermann, 1898, II, p. 1501.)

Not uncommon in San Diego Bay. Known northward to Astoria, Oregon (Girard, 1858, p. 197). Usually common on sandy beaches.

106. **Hyperprosopon agassizii** Gill.

(Jordan and Evermann, 1898, II, p. 1502.)

Reported southward to Santa Barbara; not seen by us. Known from San Francisco to Santa Barbara (Jordan and Gilbert, 1880, p. 456). Rather common southward.

107. **Holconotus rhodoterus** Agassiz.

(Jordan and Evermann, 1898, II, p. 1502.)

Rather rare; not seen by us. It ranges from San Francisco (Jordan and Gilbert, 1880, p. 456) to San Diego (Eigenmann, 1892, p. 156).

108. **Amphistichus argenteus** Agassiz.

SURF-FISH.

(Jordan and Evermann, 1898, II, p. 1503.)

Reported by Eigenmann (1892, p. 156) to be common in the surf of the ocean beaches, but not taken in San Diego Bay. A specimen examined from San Clemente Island. Known northward to Cape Flattery (Girard, 1858, p. 199).

109. **Embiotoca jacksoni** Agassiz.

BLACK PERCH.

(Jordan and Evermann, 1898, II, p. 1504.)

Next to *Cymatogaster aggregatus,* the most abundant surf-fish in San Diego Bay. The largest specimen taken was thirteen inches in length. During the latter part of December and the early part of January females were with young apparently ready to be born. The young were forty-three millimeters in entire length, the tail being a third of this, and the other fins were about as long.

Adult life color: Olive green or occasionally reddish brown, lighter on side than on back or belly; each scale with a bright cobalt blue spot, especially in smaller specimens; several faint dusky bars on back and side. Vertical fins dark blue, the anal bright cobalt at base. Occasional specimens have the ventrals

dark blue at base, but changing abruptly to bright orange, and at irregular intervals a single anal ray is bright orange.

This species occurs from Puget Sound (Jordan and Starks, 1895, p. 797) south to Cerros Island (Jordan and McGregor, 1898, p. 281.) It is not abundant northward.

110. **Taeniotoca lateralis** (Agassiz).

STRIPED SURF-FISH.

(Jordan and Evermann, 1898, II, p. 1505.)

Rare southward; not seen by us. It is found from San Benito Island, Lower California (Jordan and McGregor, 1898, p. 281) northward to Puget Sound (Jordan and Starks, 1895, p. 797).

111. **Phanerodon furcatus** Girard.

WHITE SURF-FISH.

(Jordan and Evermann, 1898, II, p. 1506, fig. 583.)

Several specimens taken at San Diego Bay. Found north to San Francisco (Jordan and Gilbert, 1880, p. 456) in abundance.

112. **Phanerodon atripes** (Jordan and Gilbert).

(Jordan and Evermann, 1898, II, p. 1507.)

One specimen taken in San Diego Bay. Occurring from Monterey Bay (Jordan and Gilbert, 1880, p. 456) to San Diego; abundant northward.

113. **Rhocochilus toxotes** Agassiz.

ALFIONE.

(Jordan and Evermann, 1898, II, p. 1507, fig. 584.)

One specimen from San Pedro. Ranging from San Francisco (Jordan and Gilbert, 1880, p. 456) to San Diego (Eigenmann, 1892, p. 157). It is rather common northward, but rare at San Diego.

114. **Hypsurus caryi** (Agassiz).

(Jordan and Evermann, 1898, II, p. 1508, fig. 585.)

Rare south of Point Conception; not seen by us. Known from San Francisco (Jordan and Gilbert, 1880, p. 456) to San Diego (Smith, 1880); common northward.

115. **Damalichthys argyrosomus** (Girard).

WHITE PERCH.

(Jordan and Evermann, 1898, II, p. 1509, fig. 586.)

Reported by Eigenmann (1892, p. 157) to be moderately abundant at San Diego in the winter time. Not seen by us. It is found northward to Puget Sound (Jordan and Starks, 1895, p. 797).

Family POMACENTRIDÆ.

116. **Chromis punctipinnis** (Cooper).

BLACKSMITH.

(Jordan and Evermann, 1898, II, p. 1548.)

Not uncommon south of Point Conception; specimens examined in the collection of the San Diego Natural History Society. Known from Cerros Island (Jordan and McGregor, 1898, p. 282) to Santa Barbara (Jordan and Gilbert, 1880, p. 455). It is rather common about rocky places.

117. **Hypsypops rubicunda** (Girard).

GARABALDI; GOLDFISH.

(Jordan and Evermann, 1898, II, p. 1564, fig. 591.)

Specimens from La Jolla and San Pedro; very abundant in rocky places at the former locality. It is known southward to Cerros Island (Jordan and McGregor, 1898, p. 282) northward to Santa Barbara (Jordan and Gilbert, 1880, p. 455). It is also known from the Santa Barbara Islands.

Family LABRIDÆ.

118. **Pimelometopon pulcher** (Ayres).

FAT-HEAD; REDFISH.

(Jordan and Evermann, 1898, II, p. 1585, fig. 598.)

Very common at San Diego outside of the bay. Known southward to Guadalupe Island (Jordan and McGregor, 1898, p. 283), and northward to Monterey (Jordan and Gilbert, 1880, p. 455). It reaches a weight of fifteen pounds, and is caught in great abundance on the Southern California coast.

119. **Halichoeres semicinctus** (Ayres).

KELPFISH.

(*Iridio semicinctus* Jordan and Evermann, 1898, II, p. 1592.)

Specimens from the ocean-side of Point Loma. It occurs from San Pedro (Jordan and Gilbert, 1880, p. 455) southward to Cerros Island (the type locality). It is a common species and reaches a length of a foot.

120. **Oxyjulis californica** (Günther).

SENORITA.

(Jordan and Evermann, 1898, II, p. 1601.)

Several specimens from La Jolla; the young rather common in the tide pools. Ranging from Guadalupe Island (Jordan and McGregor, 1898, p. 283) northward to Monterey Bay (Jordan and Gilbert, 1880, p. 455).

Family EPHIPPIDÆ.

121. **Chaetodipterus zonatus** (Girard).

ANGEL-FISH.

(Jordan and Evermann, 1898, II, p. 1668.)

The type of this species was taken at San Diego by Girard (1858, p. 110), but has not since been taken so far north. It is abundant from Mazatlan to Guayaquil, Ecuador.

Family BALISTIDÆ.

122. **Balistes cinereus** Richardson.

PEZ PUERCO.

(*Balistes polylepis* Jordan and Evermann, 1898, II, p. 1700.)

A stuffed skin of this species that was taken by Mr. T. Shooter at Santa Catalina Island was sent to Dr. Jordan, and Dr. Jordan recently saw a live specimen in the aquarium at that locality. It has not before been recorded north of Magdalena Bay, Lower California. It ranges south to Panama.

Family TETRAODONTIDÆ.

123. **Spheroides politus** (Girard).

(*Spheroides annulatus politus* Jordan and Evermann, 1898, II, p. 1736.)

This species was recorded from San Diego by Girard (1858, p. 340), but has not since been seen so far north. It is known southward to Mazatlan, Mexico.

Family DIODONTIDÆ.

124. **Chilomycterus affinis** Günther.

(*Chilomycterus californiensis* Jordan and Evermann, 1898, II, p. 1751.)

This species is known from Japan, the Hawaiian, and the Galapagos Islands. We follow Jordan and Evermann (1903, p. 438) in referring *Chilomycterus californiensis* Eigenmann from San Pedro to this species, though it appears to differ somewhat in color. Eigenmann's type is the only specimen known from our coast.

Family MOLIDÆ.

125. **Mola mola** (Linnæus).

SUNFISH; MOLA.

(Jordan and Evermann, 1898, II, p. 1753, fig. 651.)

Occasionally taken by the fishermen; a stuffed skin seen at San Diego. This is a pelagic species, inhabiting most temperate and tropical seas, and is found as far north as England, Cape Cod, and San Francisco. It is said to reach a weight of 1,500 pounds, but is of no value.

126. **Sebastolobus alascanus** Bean.

(Jordan and Evermann, 1898, II, p. 1761.)

Known from deep water from Alaska to Santa Barbara Island, where specimens were taken on trawl lines in from ten to fifteen fathoms of water (Gilbert, 1898, p. 25).

Family SCORPÆNIDÆ.

127. **Sebastolobus altivelis** Gilbert.

(Jordan and Evermann, 1898, II, p. 1763, fig. 654.)

Specimens have been taken in rather deep water off San Diego. Its range extends northward to Alaska. It reaches a length of a little more than a foot, and is occasionally taken by fishermen on long lines when fishing for *Sebastodes*.

128. **Sebastodes goodei** Eigenmann and Eigenmann.

(Jordan and Evermann, 1898, II, p. 1779.)

One specimen 15 inches in length taken in deep water off Point Loma. It has a series of transverse, dark bars below the lateral line, slightly arched toward the head. Specimens in the Stanford University collections show some variations from the original description (Eigenmann and Eigenmann, 1890, p. 12). Specimens from 8½ to 18 inches long have the eye from 3⅚ to 4⅗ in head, slightly shorter than length of snout. In a specimen 5 inches long the eye is 3⅓ in head and longer than snout. In specimens from 12 to 18 inches long the diameter of the eye is less than the interorbital width; in specimens from 5 to 8½ inches long the eye is greater than the interorbital width. The interorbital width is contained from 3¾ to 4½ in head. In specimens from 8½ to 18 inches long the occipital ridges do not end in spines; in specimens 5 inches long they do end in spines. In specimens from 15 to 18 inches long the depth of the caudal peduncle is a little greater than the diameter of the orbit; in a specimen 12 inches long it is equal to the diameter of the orbit; and in smaller specimens it is less than the diameter of the orbit. The second anal spine is from ½ to ⅔ of the diameter of the orbit in all of these specimens.

This species is taken in abundance about the Santa Barbara Islands, Coronado Islands, and Cortez Banks in rather deep water. It reaches a length of 18 inches, and extends its range northward to Monterey (Gilbert, 1893, p. 466).

129. **Sebastodes paucispinis** (Ayres).

BOCACCIO.

(Jordan and Evermann, 1898, II, p. 1780.)

Abundant in rather deep water off San Diego, and ranging northward to San Francisco (the type locality). It is one of the most important of the rockfish, reaching a weight of 15 pounds. The young are found in shallow water northward, and are caught with hook and line by the boys, who know them as "Tom-cod." We did not see the young in San Diego Bay.

130. **Sebastodes flavidus** (Ayres).

YELLOW-TAIL ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1781.)

A few specimens seen in the San Diego market. It is found in abundance northward to San Francisco (type locality), and reaches a length of two feet, though its usual length is about 16 inches. Its yellow tail will usually serve to distinguish it from other species.

131. **Sebastodes serranoides** Eigenmann and Eigenmann.

(Jordan and Evermann, 1898, II, p. 1782.)

Not uncommon in deep water off San Diego. Its northern range is unknown. Cortez Banks is the type locality.

132. **Sebastodes mystinus** Jordan and Gilbert.

BLACK ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1784, fig. 627.)

Specimens seen in the San Diego markets. It ranges northward to Puget Sound (Jordan and Gilbert, 1880, p. 455), and is very abundant about San Francisco. It is an important food fish and reaches a weight of five pounds.

133. **Sebastodes rufus** Eigenmann and Eigenmann.

(Jordan and Evermann, 1898, II, p. 1786.)

Originally described from off Point Loma and Cortez Banks. Not seen by us. It reaches a length of 22 inches.

134. **Sebastodes macdonaldi** (Eigenmann and Beeson).

(Jordan and Evermann, 1898, II, p. 1786.)

Described off San Diego; length 24 inches; not seen by us.

135. **Sebastodes ovalis** (Ayres).

(Jordan and Evermann, 1898, II, p. 1788.)

Reported to be rather common by Eigenmann (1892, p. 163), in the San Diego markets; not seen by us. It ranges northward to San Francisco, and is not very important as a food fish.

136. **Sebastodes alutus** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1790, fig. 661.)

The type of this species was taken by the U. S. S. Albatross near Santa Cruz Island. It has not since been taken on the California coast, but it is abundant about the Aleutian Islands (Gilbert, 1893, p. 408).

137. **Sebastodes proriger** (Jordan and Gilbert).

(Jordan and Evermann, 1898, II, p. 1792.)

This species is rather abundant in deep water off San Diego. Said by Eigenmann (1892, p. 164) to reach a length of two feet. It is not usually found, however, to exceed a foot in length. It ranges northward to San Francisco (Jordan and Gilbert, 1880, p. 455).

138. **Sebastodes pinniger** (Gill).

ORANGE ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1793, fig. 662.)

Not very abundant southward; one specimen seen in the market at San Diego. It ranges north to Puget Sound (Jordan and Gilbert, 1880, p. 455), and about San Francisco; is one of the most abundant and important of the rockfishes.

139. **Sebastodes miniatus** (Jordan and Gilbert).

RASCIERA.

(Jordan and Evermann, 1898, II, p. 1794.)

This is a large and important fish at San Diego; it is represented in every boat load of rockfishes that is brought in. The

deep vermillion color of the back, dusted over with black dots, is different from any other of the red rockfishes. It is found northward to San Francisco (Jordan and Gilbert, 1880, p. 455).

140. **Sebastodes atrovirens** (Jordan and Gilbert).

GARRUPA.

(Jordan and Evermann, 1898, II, p. 1797.)

This species is said to be common on the Southern California coast; it was not seen by us. It is found from San Diego (Eigenmann, 1892, p. 164) to San Francisco (Jordan and Gilbert, 1880, p. 455), and reaches a length of 15 inches.

141. **Sebastodes saxicola** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1798.)

Specimens taken from near San Pedro. The typical specimens were taken in abundance about the Santa Barbara Islands from 44 to 155 fathoms by the U. S. S. Albatross. It is found northward to the coast of Oregon (Gilbert, MS. notes).

142. **Sebastodes semicinctus** Gilbert.

(Jordan and Evermann, 1898, II, p. 1800.)

This is a small species, only 7 inches in length, known from deep water in the Santa Barbara Channel. The typical specimens were taken in 55 and 155 fathoms.

143. **Sebastodes diploproa** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1801.)

A small species taken by the U. S. S. Albatross in 124 fathoms about the Coronado Islands. It is known northward to San Francisco (Gilbert, 1893, p. 467).

144. **Sebastodes aurora** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1802.)

The typical specimens taken by the U. S. S. Albatross about the Santa Barbara Islands, in 233 and 267 fathoms, 12 inches in length. It is known northward to Monterey Bay (Gilbert, 1893, p. 467).

145. **Sebastodes melanostomus** Eigenmann and Eigenmann.

(Jordan and Evermann, 1898, II, p. 1803.)

Known only from the type, about 22 inches in length, from off Point Loma; probably rare.

146. **Sebastodes introniger** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1803.)

This species was described from two specimens taken by the U. S. S. Albatross about the Santa Barbara Islands in 266 fathoms, and has since been taken by the Albatross near Unalaska Island in depths of from 85 to 350 fathoms.

147. **Sebastodes ruberrimus** Cramer.

RED ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1805.)

This is one of the largest of the rockfishes, reaching a length of 30 inches. It is found from Puget Sound (Jordan and Gilbert, 1880, p. 455) to San Diego. Eigenmann (1892, p. 164) records it from the latter locality under the name *Sebastodes ruber.*

148. **Sebastodes constellatus** (Jordan and Gilbert).

SPOTTED ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1806.)

Specimens seen in the San Diego markets on several occasions. It ranges north to San Francisco (Jordan and Gilbert, 1880, p. 455), and is generally common. It is a well-marked species and may be known by the color: bright red with shades of orange, olive on the back, everywhere covered with small flakes of white or light rose color.

149. **Sebastodes umbrosus** (Jordan and Gilbert).

(Jordan and Evermann, 1898, II, p. 1807.)

One specimen taken in deep water off Point Loma. This is apparently a rare species, and is confined to the coast of California below Point Conception.

150. **Sebastodes rosaceus** (Girard)

CORSAIR.

(Jordan and Evermann, 1898, II, p. 1808.)

This is a small bright red rockfish abundant from San Francisco to San Diego; specimens often seen in the market at the latter place. It is known southward to Cerros Island (Gilbert, MS. notes).

151. **Sebastodes ayresii** Gilbert and Cramer.

(Jordan and Evermann, 1898, II, p. 1808.)

Known only from the type, 9 inches in length, taken on a trawl line at Cortez Banks by the U. S. S. Albatross.

152. **Sebastodes rhodochloris** (Jordan and Gilbert).

FLY FISH.

(Jordan and Evermann, 1898, II, p. 1809.)

One specimen, 11½ inches in length, taken off Point Loma. It agrees in most respects with the original description. The narrowest width of the interorbital space is equal to the length of the supraocular spine; the longest dorsal spine is contained 3 times in the head; the second anal spine is shorter than the maxillary or the base of the soft dorsal, and is contained 2½ times in the head. In the original description the width of the interorbital space is said to be less than the length of the supraocular spine; the longest dorsal spine is contained 2⅔ times in the head; and the second anal spine is equal to the length of the maxillary, or the base of the soft dorsal, or 1½ of the head.

A specimen 6 inches in length (locality unknown) agrees in all of the above respects with the original description.

This species is rather rare and has hitherto been recorded only from deep water off Monterey (type locality), and from off Point Conception. (Albatross Station 2973, Gilbert, MS. notes.)

153. **Sebastodes eos** Eigenmann and Eigenmann.

(Jordan and Evermann, 1898, II, p. 1810.)

Known only from off Point Loma, where it is reported by Eigenmann (1892, p. 165) to be abundant at times. Not seen by us.

154. **Sebastodes gilli** Eigenmann and Eigenmann.

(Jordan and Evermann, 1898, II, p. 1811.)

This species is known only from the typical specimens taken off Point Loma.

155. **Sebastodes chlorostictus** (Jordan and Gilbert).

PESCA VERMIGLIA.

(Jordan and Evermann, 1898, II, p. 1811.)

One specimen from near San Pedro. It is found in abundance in deep water northward to San Francisco, and reaches a length of 15 inches. It is a very pretty fish; light red or pink on sides with shades of orange; upper part of body closely covered with small round green spots.

156. **Sebastodes rupestris** Gilbert.

(Jordan and Evermann, 1898, II, p. 1812.)

This species is known from the typical specimens from the Santa Barbara Islands, and from a specimen from off Cerros Island (Gilbert, MS. notes.)

157. **Sebastodes zacentrus** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1814.)

This species is known from the Santa Barbara Islands (type locality) to Coos Bay, Oregon. A specimen in the Stanford University collections from the latter locality.

158. **Sebastodes elongatus** (Ayres).

REINA.

(Jordan and Evermann, 1898, II, p. 1815.)

Specimens from San Pedro. A small well-marked species found in abundance in rather deep water from San Diego (Eigenmann, 1892, p. 165) to a little north of Point Reyes (Gilbert, 1893, p. 408).

159. **Sebastodes levis** (Eigenmann and Eigenmann).

COWFISH.

(Jordan and Evermann, 1898, II, p. 1816).

Daily brought to the San Diego market. It is locally known as the cowfish, a name without obvious application unless on account of its size. It reaches a length of three feet and a weight of 30 pounds.

160. **Sebastodes rubrivinctus** (Jordan and Gilbert).

SPANISH FLAG.

(Jordan and Evermann, 1898, II, p. 1817.)

Reported by Eigenmann (1892, p. 166) to be occasionally brought to the San Diego markets. With its broad cross-bands of red, white and red it is appropriately known as the Spanish flag. In coloration it is the most brilliant fish on our coast. It is a rather rare species found in deep water northward to San Francisco.

161. **Sebastodes auriculatus** (Girard).

BROWN ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1817.)

A specimen from San Pedro. This is a small rockfish found from San Martin Island (Jordan and Gilbert, 1881*a*, p. 279) northward to San Francisco. North of Point Conception it is found in the shallow bays, but at San Diego in common with many other species of similar habits it is unknown from the bay, probably on account of the warm water. It may readily be known by the presence of coronal spines (see Cramer, 1895, Pl. LXV, fig. 26).

162. **Sebastodes rastrelliger** (Jordan and Gilbert).

GRASS ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1819.)

This species is known from San Diego (Eigenmann, 1892, p. 167) to San Francisco (Jordan and Gilbert, 1880, p. 455). It is

abundant in water of moderate depths, especially south of Point Conception, and reaches a length of 15 inches. From its relatives it may be at once known by its very short gill rakers. General color dusky green with paler mottlings.

163. **Sebastodes vexillaris** (Jordan and Gilbert).

(Jordan and Evermann, 1898, II, p. 1821.)

One specimen from off Point Loma. This is one of the larger rockfishes, reaching a length of two feet. It is found in great abundance from San Diego to San Francisco (Jordan and Gilbert, 1880, p. 455).

164. **Sebastodes gilberti** Cramer.

(Jordan and Evermann, 1898, II, p. 1823.)

Specimens from San Pedro. This is a rare species hitherto known only from about San Francisco (type locality), and now recorded for the first time from Southern California.

165. **Sebastodes carnatus** (Jordan and Gilbert).

FLESH-COLORED ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1824.)

Several specimens taken off Point Loma, and the young up to four inches long taken in tide pools on the ocean side of the point. It was the only species of rockfish we found in the pools. They are darker than specimens from Monterey Bay; the flesh-colored blotches are less distinct, especially on the large fish. This species reaches a length of 15 inches, and is found in rather shallow water north to San Francisco (Jordan and Gilbert, 1880, p. 455).

166. **Sebastodes chrysomelas** (Jordan and Gilbert).

BLACK AND YELLOW ROCKFISH.

(Jordan and Evermann, 1898, II, p. 1825.)

This is one of the smaller of the rockfishes, and is found in water of moderate depths from San Diego (Eigenmann, 1892, p. 167) to San Francisco. It is abundant in shallow water about San Diego, but does not enter the bay. It is well marked in color

and can be readily distinguished by that character alone. Black or very dark brown with blotches of clear, warm, brownish yellow in more or less definite areas. The dark color predominating above, the yellow below.

167. **Sebastodes serriceps** (Jordan and Gilbert).

TREEFISH.

(Jordan and Evermann, 1898, II, p. 1827, fig. 667.)

A small specimen taken at San Pedro. This is a moderate sized rockfish found in rather shallow water from San Diego (Eigenmann, 1892, p. 168) to San Francisco. It is strikingly marked with about seven black cross-bands on a ground of yellow shading to coppery red.

168. **Scorpaena guttata** Girard.

SCULPIN; SCORPENE.

(Jordan and Evermann, 1898, II, p. 1847.)

Rather common in San Diego Bay. Young specimens have a broad, light cross-band, its width equal to length of maxillary, extending across middle of body and involving posterior 2/5 of spinous dorsal, front of soft dorsal, tips of pectoral and ventral, and anterior edge of anal. Another similar but somewhat narrower band across the posterior part of the body and posterior half of dorsal and anal. A third band on basal 2/5 of caudal fin, and a light border on caudal fin posteriorly. A specimen in the collection of the Marine Biological Association's laboratory at La Jolla has 13 spines in the dorsal.

Found from Ascension Island on the west coast of Mexico (Jordan and Gilbert, 1881*a*, p. 278) northward to Monterey (the type locality). It reaches a length of a foot and is a food fish of fair quality. The wound made by the dorsal spines of this fish is said to be exceedingly painful, like the sting of a sting-ray. From this fact it doubtless has received its common name Scorpene—Scorpion.

Family ANOPLOPOMATIDÆ.

169. **Anoplopoma fimbria** (Pallas).

COALFISH; BLACK COD.

(Jordan and Evermann, 1898, II, p. 1862, fig. 675.)

This species is here recorded on our southern coast for the first time. One specimen was seen from the deep water off Point Loma, where it is reported by the fishermen to be not uncommon. It is sometimes salted, but there is no market for it in the fresh state, being dry and tasteless. It ranges northward to Sitka (Bean, 1881, p. 254) in moderately deep water, and is abundant in Puget Sound.

Family HEXAGRAMMIDÆ.

170. **Ophiodon elongatus** Girard.

BLUE COD.

(Jordan and Evermann, 1898, II, p. 1875, fig. 682.)

One specimen seen in the San Diego market. The fishermen report it to be not rare in the deeper waters off Point Loma. Its range extends northward to Sitka, Alaska (Bean, 1881, p. 254), and in northern waters it reaches a length of five feet and a weight of sixty pounds. North of Conception Point it is very abundant and is one of the most important fishes of our coast. Its common names "Blue Cod," "Cultus Cod," "Bastard Cod," and "Buffalo Cod" are all unfortunate, as it is unrelated to the true codfish.

171. **Zaniolepis latipinnis** Girard.

(Jordan and Evermann, 1898, II, p. 1876.)

Several small specimens, the largest 2½ inches in length, taken at San Pedro.

In the key to the species of *Zaniolepis,* Jordan and Evermann state that no supraorbital flap is present in this species. An examination of many specimens in the Stanford University collections from different localities shows the supraorbital flap present about as often as absent; occasionally present on one side only.

It is much smaller than in *Zaniolepis frenatus*, and often difficult to find.

This species ranges northward to Puget Sound (the type locality) to San Diego (Gilbert, MS. notes). It may be easily known from *Zaniolepis frenatus* by the long second spine of the dorsal which is always longer than the head, and in large specimens half as long as the entire body. It reaches a length of 12 inches.

172. **Zaniolepis frenatus** Eigenmann.

(Jordan and Evermann, 1898, II, p. 1877.)

This species is known from the Santa Barbara Islands (Gilbert, 1898, p. 26), and from Cortez Banks (the type locality). It does not exceed eight inches in length.

173. **Oxylebius pictus** Gill.

(Jordan and Evermann, 1898, II, p. 1878.)

A specimen recorded by Dr. Gilbert (MS. notes) from off San Miguel Island increases the range of this species southward from Monterey. It is known northward to Puget Sound (Jordan and Starks, 1895, p. 802).

Family COTTIDÆ.

174. **Paricelinus hopliticus** Eigenmann and Eigenmann.

(Jordan and Evermann, 1898, II, p. 1886.)

Hitherto known only from a single small specimen from the stomach of *Sebastodes levis* taken at a depth of 48 fathoms on Cortez Banks. Dr. Gilbert (MS. notes) records a specimen ("partly digested") from off Oregon.

175. **Scorpaenichthys marmoratus** (Ayres).

CABEZON.

(Jordan and Evermann, 1898, II, p. 1889.)

Reported to be not rare near San Diego; one specimen seen. It is the largest sculpin on the Pacific Coast, and ranges northward to Puget Sound (Jordan and Starks, 1895, p. 808), being most abundant about Monterey. Its value is small, as its flesh is tough and of poor flavor.

176. **Chitonotus pugetensis** (Steindachner).

(Jordan and Evermann, 1898, II, p. 1890, fig. 687.)

Specimens from San Pedro. A specimen in the Stanford University collections taken by the U. S. S. Albatross near San Diego extends the range of this species southward. It grows to a length of six inches, and ranges north to Puget Sound (the type locality), being not rare in water of moderate depth. A specimen 1¼ inches in length has the upper preopercular spine bifid with no trace of additional prongs. The adults agree with the description by Jordan and Evermann in this as in other characters.

177. **Tarandichthys cavifrons** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1891.)

One specimen from San Pedro. It is known only from about the Santa Barbara Islands in rather deep water. Length 3½ inches. It may be known from other species of *Tarandichthys* by a pit-like depression at the occiput.

178. **Tarandichthys filamentosus** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1892.)

Coast of Southern California in rather deep water; no specimens seen by us. It reaches a length of 9 inches. It may be known from *Tarandichthys tenuis* by the first two dorsal spines being produced into long filaments which reach to the middle of the soft dorsal.

179. **Tarandichthys tenuis** (Gilbert).

(Jordan and Evermann, 1898, II, p. 1893.)

Several specimens from San Pedro. This species is known only from the vicinity of the Santa Barbara Islands in rather deep water. The second dorsal spine is sometimes slightly produced, but is never long.

180. **Icelinus fimbriatus** Gilbert.

(Jordan and Evermann, 1898, II, p. 1895.)

Known from specimens taken by the U. S. S. Albatross in rather deep water off the Santa Barbara Islands. It may be

easily known from *Icelinus quadriseriatus,* the only other *Icelinus* found in this region, by the tentacles on the nasal spines.

181. **Icelinus quadriseriatus** (Lockington).

(Jordan and Evermann, 1898, II, p. 1897.)

Specimens taken in abundance on the banks off Point Loma, and near San Pedro. They have from 8 to 10 spines, and 13 or 14 rays in the dorsal. The pectoral reaches a little past the front of anal. A black spot is present at each end of spinous dorsal, and a bright canary yellow spot is on lower part of the mandible in life. This species is abundant in waters of moderate depths north of San Francisco (the type locality).

182. **Astrolytes notospilotus** (Girard).

(Jordan and Evermann, 1898, II, p. 1899, fig. 689.)

Abundant off Santa Barbara (Jordan and Gilbert, 1880, p. 61); no specimens seen by us. It reaches a length of 10 inches, and is found north to Puget Sound (Jordan and Gilbert, 1881, p. 454).

183. **Icelus australis** Eigenmann and Eigenmann.

(Jordan and Evermann, 1898, II, p. 1918.)

Known only from two small partly digested specimens from the stomach of *Sebastodes miniatus* taken at Cortez Banks.

184. **Rudulinus boleoides** Gilbert.

(Jordan and Evermann, 1898, II, p. 1919.)

Known only from the type taken off Santa Catalina Island by the U. S. S. Albatross.

185. **Calycilepidotus spinosus** Ayres.

(Jordan and Evermann, 1898, II, p. 1937.)

Hitherto known only from Monterey and San Francisco in rather deep water. Here recorded (Gilbert, MS. notes) from off the Santa Barbara Islands.

186. **Enophrys bison** (Girard).

(Jordan and Evermann, 1898, II, p. 1938.)

A specimen in Stanford University taken a little south of Point Conception extends the range of this species southward from San Francisco. It is known northward to Sitka, Alaska (Bean, 1881, p. 249).

187. **Leiocottus hirundo** Girard.

(Jordan and Evermann, 1898, II, p. 2011, fig. 732.)

This species reaches a length of 10 inches, and is known only from the Santa Barbara Islands. It is abundant but extremely local. Not seen by us.

188. **Leptocottus armatus** Girard.

(Jordan and Evermann, 1898, II, p. 2012.)

Very common in San Diego Bay; a haul of the seine seldom failed to bring in several small ones. The largest taken was 6½ inches in length. Our specimens agree with the original description and with current descriptions only when measured in total length to tip of caudal. Head 2⅘ in length to base of caudal; depth 5½. The eye is greater than the interocular width, and is contained 6⅔ times in head in our largest specimens (not less than interocular width, 7½ times in head).

This species is one of the most abundant Cottoids on the Pacific Coast, and is known from Kadiak Island, Alaska (Bean, 1881, p. 251), to San Diego. It is found in shallow water, and reaches a length of a foot.

189. **Clinocottus analis** (Girard).

(Jordan and Evermann, 1898, II, p. 2012.)

One of the commonest fishes in the rock pools; not seen inside of San Diego Bay. The large males often develop conspicuous flaps on the tips of the anterior dorsal spines.

In life: slate color with 5 or 6 irregular black cross bars, these very conspicuous in the water but much less so when the fish is

dead. Sometimes, especially in large specimens, everywhere spotted with orange dots. Belly and chin light drab or green in small specimens, the latter spotted with darker; sides of head coal black. Pectoral with red shades; membrane of soft dorsal sometimes edged with brilliant red. A dark band on caudal usually black, sometimes red; membrane of caudal light reddish, and with transparent spots. Some specimens taken in clear, open pools with sandy bottoms were very light, but when dead could not be distinguished from the others.

This species occurs from San Francisco southward to San Martin Island, Lower California (Jordan and McGregor, 1898, p. 284). It reaches a length of 7 inches, and is everywhere abundant in tide pools. It may be readily known from other Cottoids occurring with it by the rough feeling when the finger is passed along the side toward the head.

190. **Oligocottus rubellio** (Greeley).

(*Eximia rubellio,* Jordan and Evermann, 1900, IV, p. 3182.)

Four specimens taken in the tide pools on the ocean side of Point Loma. The species may be known from *Oligocottus maculosus* by its longer head and larger eye.

Color in life: body light translucent green with black cross spots and bars on back. A bright reddish plum-colored area from middle of interorbital to tip of snout; similar spots on nape, opercles, and base of pectoral; a tinge of the same color between bars on back. Belly and chin greenish blue; tail reddish brown with white cross markings; lower part of pectoral orange yellow. Other specimens were darker and without much of the red color, but with many milk white spots.

The genus *Eximia* (to which this species was originally assigned) founded on specimens having the preopercular spine three pointed is not valid. Our specimens from Point Loma have both two- or three-pointed preopercular spines, and one specimen has a two-pointed spine on one side and a three-pointed spine on the other. The typical specimens from Pacific Grove, in the Stanford University collections, range from an imperfectly developed three-pointed spine to a well developed four-pointed spine.

Specimens of *Oligocottus maculosus* from Neah Bay, Washington, and of *Dialarchus snyderi* from Pacific Grove, California, occasionally have three-pointed preopercular spines. In some cases the third spine is very small and appears to be an outgrowth from the lower fork of the bifid spine. In others it is as well developed as in the typical *Eximia.*

191. **Blennicottus recalvus** Greeley.

(Jordan and Evermann, 1900, IV, p. 3178.)

Several small specimens, the longest 1½ inches in length, taken by Dr. W. W. Thoburn at the Coronado Islands. We did not see it on the mainland. It is probable that the records of *Blennicottus globiceps* this far south refer to this species, or possibly to *Oligocottus rubellio.* The range of this species is northward to Santa Cruz (Greeley, 1899, p. 9). It is abundant in Monterey Bay.

Family AGONIDÆ.

192. **Averruncus sterletus** Gilbert.

(Jordan and Evermann, 1898, II, p. 2071, figs. 750–750*a.*)

The type of this species, 4½ inches in length, was taken by the U. S. S. Albatross at a depth of 45 fathoms near the Coronado Islands.

193. **Xeneretmus*** **pentacanthus** (Gilbert).

(*Xenochirus pentacanthus* Jordan and Evermann, 1898, II, p. 2080.)

Specimens from San Pedro. This species may be known at once from *Xeneretmus latifrons,* the only other species of the genus found on the south coast, by the rostral plate having three upright spines. It reaches a length of 7 inches.

In the synonomy of this species given by Jordan and Evermann the typical specimens are stated to come from Bering Sea and off San Diego. They came from the coast of Washington a

* The generic name *Xenochirus* being preoccupied has been replaced by *Xeneretmus.*

little south of Cape Flattery (Albatross Station 3076). Specimens have since been taken from the Straits of Fuca, from off Oregon, the Santa Barbara Islands, and San Diego (Gilbert, MS. notes).

194. **Xeneretmus latifrons** (Gilbert).

(*Xenochirus latifrons* Jordan and Evermann, 1898, II, p. 2082.)

The types taken by the U. S. S. Albatross in deep water off Oregon and San Diego in from 50 to 204 fathoms. The largest specimen is 7½ inches in total length. The rostral plate has one upright spine.

195. **Odontopyxis trispinosus** Lockington.

(Jordan and Evermann, 1898, II, p. 2085.)

Specimens from off Point Loma and San Pedro. The origin of the anal in our specimens is as described for the typical specimens, opposite front of second dorsal, or one pair of plates farther forward; not "about one pair of plates behind front of second dorsal," as stated by Jordan and Evermann.

This species is common to Puget Sound (Jordan and Starks, 1895, p. 827) in water of moderate depths. Length about three inches.

Family GOBIIDÆ.

196. **Rhinogobius nicholsii** (Bean).

(*Gobius nicholsii* Jordan and Evermann, 1898, III, p. 2218.)

Three specimens from San Pedro. This goby is known from the coast of British Columbia, but has never been recorded southward before, though it is apparently common. Dr. Gilbert (MS. notes) has numerous records of its occurrence on the Southern California coast. It grows to a length of three inches.

197. **Zonogobius zebra** (Gilbert).

(*Gobius zebra* Jordan and Evermann, 1898, III, p. 2226.)

A specimen from San Clemente Island one inch in length. It has not before been recorded north of the southern part of Lower California (its type locality). It and a specimen 1½ inches long

from Todos Santos Island, Mexico, agree in all essential respects with the description of the type (7, p. 73), but show the following variations; the measurement appearing first is of the San Clemente specimen. Head 3¼ and 3⅖ in length to base of caudal; depth 4¾ and 4¼. Eye 3½ and 3⅖ in head. Dorsal VI, 12 and 13; and 10 and 9. Cross-bars on head and body 16 and 15.

This is a strongly marked goby and may be at once known by its color. It has narrow cross-bars on head and body, and a narrow cross line through each interspace between the bars. It is known from the Galapagos Islands (Snodgrass and Heller. 1905, p. 416), but has not been taken between that region and Mexico.

198. **Gobionellus sagittula** (Gunther).

(*Gobius sagittula* Jordan and Evermann, 1898, III, p. 2228.)

Several specimens were taken in a brackish slough in San Diego Bay near Old Town. It has not been hitherto recorded north of the Gulf of California. Small specimens a couple of inches in length have a larger eye and a shorter caudal than the large ones, agreeing in all respects with the original description by Gunther (1861, p. 372). Large specimens up to four inches in length agree with the description by Jordan and Evermann, but have 58, not 66 series of scales.

This goby is very widely distributed, being found in brackish water southward to the coast of Ecuador (Starks, 1906, p. 799). The adults may be at once distinguished from any other goby in our region by the long, pointed caudal. It reaches a length of 8 inches.

199. **Lythrypnus dalli** (Gilbert).

(*Gobius dalli,* Jordan and Evermann, 1898, III, p. 2230.)

A single specimen 1½ inches in length taken at San Pedro. It differs somewhat from the description of the type (Gilbert, 1890, p. 73). The soft dorsal is longer, having 20 rays rather than 17; the spinous dorsal is elevated in front, the spines growing gradually shorter posteriorly. The longest spine reaching to base of seventh ray, not the first two produced, reaching beyond middle of soft dorsal; the caudal is as long as the head, not less

than length of head; the third cross-bar runs downward from between the last two spines of dorsal, not from under middle of spinous dorsal; the scales number 47 in the lateral line, not 40. A decided median crest extends from the dorsal between the anterior margin of the eyes.

A specimen from Catalina Island in the Stanford University collections has the soft dorsal of 18 rays, and the medium crest is interrupted at the occiput. Three specimens 7/8 of an inch long from the Gulf of California have the soft dorsal of 17 rays; the scales in the lateral line from 44 to 47; the condition of the dorsal spines and the position of the third bar as in our San Pedro specimen; the median crest not extending on to the head as in larger specimens.

Known only from the above localities. Dr. Gilbert has recently observed it in abundance in Catalina harbor. It is a conspicuously marked form, and may be known by the narrow, sharp, dark bands across the head and anterior part of the body. It is not known to exceed 1½ inches in length.

200. **Lepidogobius lepidus** (Girard).

(Jordan & Evermann, 1898, III, p. 2249.)

Specimens examined from off San Diego. It is found northward to Puget Sound (Jordan & Starks, 1895, p. 839), and is sometimes seined in large numbers about San Francisco and used as food.

201. **Gillichthys mirabilis** Cooper.

(Jordan & Evermann, 1898, III, p. 2250.)

This species was taken in abundance in a slough which received some fresh water near Old Town, but was not seen by us in any other part of San Diego Bay, though other localities having similar conditions were seined. In Newport Bay it was found more widely distributed. Small specimens of a couple of inches in length resemble *Quietula y-cauda,* but may be known by the smooth ridge on the inner edge of the shoulder girdle, the short anal fin of from 11 to 13 rays, and by the color. At this age the maxillary is not greatly elongate, and the occipital region is not

MEASUREMENTS IN HUNDREDTHS OF LENGTHS.

LOCALITY	SAN DIEGO BAY										SANTA BARBARA						HORSESHOE BEND. COL. RIVER TYPES OF S. DETRUSUS					
Length to base of caudal in millimeters	104	107	72	111	85	89	109	73	73	113	106	88	86	89	87	90	85	99	80	101	76	101
Length of head in hundredths of length	34	32	31	35	33	34	32	32	33	34	32	33	33	34	32	34	31	32	31	33	32	32
Width of head	20	21	19	19	21	22	20	20	21	21	21	21	22	21	23	22	19	19	21	20	19	21
Width of interorbital bone	3½	4½	4½	4½	3½	4½	4	3½	4½	4½	4	4½	4½	4½	4	4	4½	4½	4½	4½	4½	4½
Width of entire interorbital space	7½	7½	8	8	7½	7½	7½	8	8	7½	8	8	8	8	8	8	8	7½	7	8	7	7½
Length of space between dorsals	9½	9	9	10	10	10	10½	9½	10½	9½	9½	8½	9	9	9	9½	9	11	10	11	11	9
Depth of caudal peduncle	11½	12	12	12	12½	12½	12	11½	12	12	11½	11½	12	12	12½	12	11	11	10½	11½	12	11
Number of dorsal spines	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI
Number of dorsal rays	14	14	14	13	13	14	13	14	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Number of anal rays	13	13	13	12	12	13	12	13	12	13	12	12	12	12	11	12	12	12	12	12	11	12

depressed and keeled. Specimens examined from Mendocino County, 1¾ inches in length, contained mature eggs.

We are unable to distinguish between this species and *Gillichthys detrusus* Gilbert and Scofield. None of the alleged differences are valid except that of color, the latter species being everywhere lighter. *Gillichthys detrusus* can not therefore be considered as a separate species.

This species is known from Puget Sound (Jordan & Starks, 1895, p. 839) to the Gulf of California (Evermann & Jenkins, 1891, p. 162), living in burrows on the mud flats. The adults may be known at once by the long maxillary, which reaches in the larger specimens past the gill opening.

202. **Quietula y-cauda** (Jenkins and Evermann).

(Jordan & Evermann, 1898, III, p. 2251.)

This species was found everywhere abundant in San Diego Bay. It differs from *Ilypnus gilberti* and *Clevelandia ios* in being generally larger and in having the occipital region of the skull keeled, rather than transversely rounded. From the former it differs in having one or two more flaps on the inner edge of the shoulder girdle; in the body being stouter; and in color. From the latter it may be known by its having flaps rather than papillæ on the shoulder girdle.

The first dorsal usually has 5 spines, but in one specimen from San Luis Gonzales Bay there are 6; the soft dorsal usually has 15 rays, or rarely 16; the anal has 14, or sometimes 15 rays. There is a series of elongate spots along the median line of the side, the one at the base of the caudal being Y-shaped.

There is a wider range of variation in this species than in the other related forms. Some San Diego specimens are more elongate in form and usually darker colored than others. Some have very dark heads, especially on the under side, while the body is uniformly light, or moderately dark; large dark spots on pectoral and ventral, and a very dark anal with a light border.

The type, which the U. S. National Museum has loaned us, agrees in coloration with our light specimens. We have also re-

examined the type of *Gillichthys guaymasiae* Jenkins and Evermann. It is without doubt referable to this species, though it is larger than any we have seen. *Quietula y-cauda* is found from Vancouver Island (Jordan & Starks, 1895, p. 839) to Guaymas, Mexico (the type locality), and is everywhere abundant on the mud flats southward.

203. **Ilypnus gilberti** (Eigenmann and Eigenmann).

(Jordan & Evermann, 1898, III, p. 2253.)

This form was taken in abundance in San Diego Bay in company with *Quietula y-cauda* and *Clevelandia ios*. It has a conspicuous dark metallic spot on the opercle, which is never absent either in fresh or alcoholic material, and serves as a convenient means of identification. It differs from *Quietula y-cauda* in having only one, rarely two, dermal flaps on the inner edge of the shoulder girdle, in having the occipital region of the cranium transversely smooth and rounded, and in being more slender and more uniformly colored. From *Clevelandia ios* it differs in having flaps instead of papillae on the inner edge of the shoulder girdle, and in being generally darker.

The dorsal has nearly always 5 spines, occasionally 4, and 15 or 16 rays; the anal has usually 15 rays, sometimes 14, and rarely 16. Most specimens do not have enlarged dark spots, the entire body and fins being dusted over with fine dark points, which form a more or less complete network of broken lines, but occasional specimens have from 3 to 6 large dark spots along the base of the dorsal. The anal is dark toward the tips of the rays, and is with or without a white border. The type which we have examined has the usual dark spot on the opercle, and a dark anal, but some specimens from the type locality do not have the latter character. Specimens from Shoal Point, Colorado River; Conception Bay, L. C.; and San Bartolome Bay have less color than our San Diego specimens, especially on the anal.

This species is known from San Pedro south to the Gulf of California.

204. **Clevelandia ios** (Jordan and Gilbert).

(*Clevelandia rosæ* Jordan and Evermann, 1898, III, p. 2254, fig. 793 (poor). See Gilbert, 1904, p. 263, for synonomy and discussion of species.)

This species is very abundant in all parts of San Diego and Newport bays. The young in great numbers are left by the tide in pools in the sand. It may be known from the other closely related gobies found with it by its uniform light sand color dusted over with black, its more slender body, and three or four papillae on the inner edge of its shoulder girdle. These papillae do not resemble the long finger-like flaps found on the shoulder girdle of *Ilypnus gilberti* and *Quietula y-cauda*. From *Ilypnus gilberti*, which it resembles most closely in size, coloration, and in having the occipital region transversely smooth and rounded, it may be readily distinguished by the absence of a metallic spot on the opercle; the body is a littel more slender and cylindrical and the dorsals are usually a little farther apart.

Dorsal IV or V very rarely VI, 15 or 16, rarely 17; anal 15 or 16.

This species is found from Vancouver Island to San Diego Bay; abundant southward. It was originally described from a specimen found in the stomach of *Hexagrammos asper* at Vancouver Island.

205. **Typhlogobius californiensis** Steindachner.

BLIND GOBY.

(Jordan and Evermann, 1898, III, p. 2262, fig. 795.)

This species is rather abundant in a small area, extending one or two hundred yards along the shore of the bay side of Point Loma, where it lives under the rocks in holes and runways made by crustacea. One specimen seen swimming slowly over the bottom of a small, clear rock pool in the bright sunlight on the ocean side of Point Loma, near the outer lighthouse. Dr. Ritter reports this fish common at Point Firmin, living there as at Point Loma.

Family ECHENEIDIDÆ.

206. **Echeneis remora** Linnæus.

REMORA.

(*Remora remora* Jordan and Evermann, 1898, III, p. 2271.)

Reported by Dr. Eigenmann (1892, p. 148) to be common at San Diego in summer. It is of cosmopolitan distribution.

Family MALACANTHIDÆ.

207. **Caulolatilus princeps** (Jenyns).

(Jordan and Evermann, 1898, III, p. 2276.)

This species is commonly taken off Point Loma. It is abundant from Monterey to Cape San Lucas, and from the Galapagos Islands (type locality) to the coast of Peru (Starks, 1906, p. 799), but between Cape San Lucas and the Galapagos Islands it is unknown. We have compared specimens from our coast with specimens from Peru, but can appreciate no difference.

Family BATHYMASTERIDÆ.

208. **Rathbunella hypoplecta** (Gilbert).

(Jordan and Evermann, 1898, III, p. 2290.)

A single specimen known, eight inches in length, taken by the U. S. S. Albatross in thirty fathoms of water off the Santa Barbara Islands.

Family BATRACHOIDIDÆ.

209. **Porichthys notatus** Girard.

MIDSHIPMAN.

(Jordan and Evermann, 1898, III, p. 2321.)

Common. Young specimens have thirteen dark cross-bars on body between head and tip of caudal, with slight traces of two similar ones across head. Abundant from Puget Sound (Jordan and Starks, 1895, p. 840) to the Gulf of California (Evermann and Jenkins, 1891, p. 162); living under stones and in tide pools

northward, in deeper water southward. The shining spots along the sides and ventral region of this fish have suggested brass buttons, and given to it its common name, midshipman. It is also called singing-fish, on account of the loud humming noise it makes when disturbed.

Family GOBIESOCIDÆ.

210. **Gobiesox papillifer** Gilbert.

(Jordan and Evermann, 1898, III, p. 2330.)

One specimen 2 inches long from San Pedro. It has hitherto been known only from Magdalena Bay, Lower California. It shows the following variations from the description of the type (Gilbert, 1890, p. 96). The anal has 10 rays (not 9); the eye is ⅔ of interorbital width (not ½). The bars on the vertical fins are very indistinct; the white bar said to follow the black bar at base of fins can not be distinguished from the dusky area following; the white margin is evident.

211. **Rimicola eigenmanni** (Gilbert).

(Jordan and Evermann, 1898, III, p. 2339.)

Known only from a single specimen, the type, taken at Point Loma and from specimens taken at San Cristobal Bay (Smith, 1884, p. 553, under the name of *Gobiesox rhessodon*).

212. **Arbaciosa rhessodon** (Rosa Smith).

(Jordan and Evermann, 1898, III, p. 2340.)

Specimens taken in abundance in tide pools on the ocean side of Point Loma, at La Jolla, and San Pedro.

A cotype in the collections of Stanford University is identical with our specimens, but differs from the original description (Rosa Smith, 1881, p. 140) in having the eye $^{6}/_{100}$ of the total length to base of caudal, not $^{3}/_{100}$. It differs from the description by Jordan and Evermann in having the head contained 2⅘ times in body, not 3¼ times; the eye 6 times in head, not 4½ times.

It is found in abundance in rock pools southward to San Bartolome Bay, Lower California.

Family BLENNIDÆ.

213. **Heterostichus rostratus** Girard.

KELPFISH.

(Jordan and Evermann, 1898, III, p. 2351.)

Common in San Diego Bay. The young was not seen in the winter, but was seldom absent from the contents of a seine in the summer.

Color in life: ground color light green; yellow on belly and under parts. Back and sides with 3 or 4 longitudinal dark green stripes, more or less broken up into spots, darker toward the edges, and outlined with white. A similar stripe running from snout through eye to upper end of gill opening. A white spot on base of middle pectoral rays; dorsal and anal mottled with alternate dark green and translucent spots; tip of mandible dark.

This species may be known from other blennies by the prominent hook-like process on the inner edge of the shoulder girdle, together with the forked tail. It reaches a length of 18 inches, and is abundant from San Francisco to Guadalupe Island (Jordan and McGregor, 1898, p. 284).

214. **Gibbonsia elegans** (Cooper).

SPOTTED KELPFISH.

(Jordan and Evermann, 1898, III, p. 2353.)

Common along the coast south of Point Conception; a single specimen from Monterey Bay.

We can not agree with the late Mr. A. W. Greeley (1899, p. 20), who has reported this species inseparable from its northern representative *Gibbonsia evides*. An examination of many specimens from San Diego, San Clemente Island, San Pedro, and Monterey Bay shows that there are two closely related but distinct species.

Gibbonsia elegans differs from *Gibbonsia evides* in being generally smaller in size, somewhat deeper in appearance, having a rounder contour of front part of head and snout, a larger eye, higher dorsal and anal fins, and of more varied and brilliant coloration. The fin rays average less; the dorsal has from 27 to 29

spines and from 6 to 9 soft rays. In *Gibbonsia evides* the dorsal has from 29 to 31 spines and from 7 to 10 soft rays. In the former species the anal has from 22 to 25 rays, while in *Gibbonsia evides* it has from 26 to 28 rays. The alleged greater extent of the pellucid area of the soft dorsal of *Gibbonsia elegans* can not be used to separate the species. Though in the average it is larger and more usually present in that species, any condition of it found in one species may be found in the other.

The species overlap in geographical range; three specimens of *Gibbonsia evides* were found at San Diego among a couple of hundred of *Gibbonsia elegans,* and one of the latter species was found at Monterey Bay among about a hundred of the former species.

The most common coloration of *Gibbonsia elegans* is as follows: Dark brown with red shades above lateral line and green below; belly, yellow or white. Irregular cross-bars mottle the sides; these are usually outlined with light blue, green, or yellow. Lower part of head and body usually spotted or reticulated with white. An ocellated spot nearly always present behind opercular flap, another under posterior fourth of spinous dorsal, and often one (usually smaller) under front of soft dorsal; these black or dark green and ringed with red. Some specimens are light maroon without cross-bars or other markings, except usually the ocellated spots, which when present are blue or brown in the middle, and ringed with dark brown, red, or blue, or sometimes with all of these colors. Membrane of caudal very light brown, spotted with round transparent spots; the rays of caudal colored like body. Last dorsal rays transparent; transparent areas on spinous dorsal at regular intervals, growing small and disappearing posteriorly; dark bars on pectoral and ventral. A silvery line running backward from eye often present. Other specimens similar to the above, but the prevailing color dull greenish drab, with or without traces of longitudinal lines. The ocellated spots green in the center, ringed with bright red. Rarely specimens are everywhere bright moss green with irregular longitudinal white lines in pairs, inclosing between each pair darker green. Bright green markings on fins. The ocellated spots dark green, ringed with very bright red. The young up to two inches in length are

often black on back, shading to very dark seal brown on sides; belly rosey. A narrow, bright silvery streak, its edges sharp, nearly as wide as eye, runs backward from eye across cheek, thence longitudinally through middle of body to opposite middle of anal. The last dorsal rays transparent as usual. Occasionally traces of the silvery streak are present in adults.

TABLE OF FIN RAYS.

	Number of specimens counted	Number of dorsal rays	Number of anal rays
San Diego Bay	16	V, XXVIII, 7	II, 24
	15	V, XXVIII, 8	II, 24
	4	V, XXIX, 7	II, 24
	4	V, XXVIII, 8	II, 25
	3	V, XXIX, 8	II, 24
	3	V, XXIX, 7	II, 25
	3	V, XXVII, 7	II, 25
	2	V, XXIX, 6	II, 24
	2	V, XXVIII, 7	II, 23
	1	V, XXIX, 8	II, 25
	1	V, XXVIII, 8	II, 22
	1	V, XXVII, 9	II, 24
	1	V, XXVII, 8	II, 24
Monterey Bay	1	V, XXVII, 8	II, 25

MEASUREMENTS IN HUNDREDTHS OF LENGTH TO BASE OF CAUDAL.*

Part of Body	San Diego Bay					San Pedro				Monterey
Length to base of caudal in mm	108	100	90	103	197	97	107	79	95	107
Length of head in hundredths of length	22	23	23	24	24	24	23½	24	24½	24½
Diameter of eye	6	5	6	5½	5½	6	5½	6	5½	6
Highest spine of dorsal	11½	11½	11½	12½	10	11	12	13	11½	10
Highest ray of dorsal	13½	12½	12	13½	12	13	13	13½	12½	12
Highest ray of anal	12	11	12	12½	11	11½	11½	12	11½	11½

*Many more specimens were measured and counted than are shown here.

215. **Gibbonsia evides** (Jordan and Gilbert).

SENORITA; KELPFISH.

(Jordan and Evermann, 1898, III, p. 2352.)

Three specimens taken at San Diego. This species has not been hitherto known south of Point Conception. Dorsal, V, XXIX to V, XXXI, 7 to 10; anal II, 26 to 27.

Color in life: usually dark wine color or dark reddish brown, with irregular cross mottlings of darker on sides; the colors not blended, but sharp-cut against each other. Small irregular golden or silvery spots usually present on lower part of sides, but often absent; small light spots on lower part of head. Dorsal and anal with broad cross marks on the dark body color; transparent in the intervals. Some specimens uniform dark reddish brown, without markings; lighter below; transparent areas on fins reduced to small dots. Some specimens moss green on back and sides; a longitudinal band of pure lavender, bordered above and below with lighter, on upper part of side, becoming narrow posteriorly and reaching a point opposite soft dorsal. It is much constricted at irregular intervals, or sometimes broken into oblong spots. A round black sopt ringed with dark red above base of pectoral; another under posterior end of spinous dorsal; a smaller one under front of soft dorsal. Some or all of these often absent. Lower part of sides mottled irregularly with moss green and lavender; the colors nowhere blended into each other; the lavender abruptly lighter at edges, the green slightly darker. Irregular points of pure white sparsely scattered over sides. Four dark bands radiating from eye; one to nape; one to opercular flap; one to snout; one downward and slightly forward. Large and small irregular silvery white spots on sides of belly. Dorsal and anal with nearly vertical dark bars across the rays; those on dorsal lavender, on anal dark brown. The intervals between the bars on dorsal transparent, mottled with small dark markings; the intervals on anal with a few fine bright orange spots. Front of soft dorsal dark brown; pink at tips of rays; posteriorly the membrane is transparent; the rays are spotted. Caudal and pectoral with irregular cross markings of reddish brown.

TABLE OF FIN RAYS.

	Number of specimens counted	Number of dorsal rays	Number of anal rays
Monterey Bay	10	V, XXXI, 9	II, 27
	12	V, XXXI, 9	II, 26
	4	V, XXX, 9	II, 27
	4	V, XXX, 8	II, 26
	4	V, XXX, 7	II, 26
	4	V, XXX, 7	II, 27
	3	V, XXX, 8	II, 27
	3	V, XXX, 7	II, 26
	2	V, XXXI, 10	II, 28
	2	V, XXXI, 10	II, 27
	2	V, XXIX, 8	II, 26
	1	V, XXXI, 9	II, 28
	1	V, XXXI, 8	II, 27
	1	V, XXXI, 8	II, 26
	1	V, XXX, 10	II, 26
	1	V, XXX 9	II, 26
	1	V, XXX, 8	II, 28
	1	V, XXIX, 8	II, 27
San Diego Bay	1	V, XXX, 10	II, 28
	1	V, XXX, 9	II, 27
	1	V, XXX, 9	II, 26

MEASUREMENTS IN HUNDREDTHS OF LENGTH TO BASE OF CAUDAL.

Part of Body	Monterey Bay					San Diego Bay
Length to base of caudal in mm.	113	70	132	119	127	78
Length of head in 100dths of length	25	22	24½	23½	23	24½
Diameter of eye	4	5½	4½	4½	4½	5
Highest spine of dorsal	9	12	9½	9	8½	9½
Highest ray of dorsal	11	11	11	10½	10½	12
Highest ray of anal	10½	10½	10½	9	9½	10

216. **Neoclinus blanchardi** Girard.

(Jordan and Evermann, 1898, III, p. 2354.)

Not rare from Monterey (Jordan and Gilbert, 1880, p. 454) to San Diego (type locality). This species differs from *Neoclinus satiricus* in having no spot behind the seventh spine of dorsal; in having the membrane of lower lip, which is covered by the maxillary, white (black, edged with white in *Neoclinus satiricus*); in

having the head and maxillary shorter, and the barbels in the male much longer.

217. **Neoclinus satiricus** Girard.

(Jordan and Evermann, 1898, III, p. 2355, fig. 816.)

Several specimens of the young of this species were taken at San Pedro. A specimen 1½ inches long has the maxillary reaching the posterior border of the pupil; in specimens from 1¾ to 2¼ inches the maxillary reaches a considerable distance past eye.

Color in spirits uniform, with small definite black spots along base of dorsal and on top of head; ten wide brown bars extend across anal; dorsal uniform light slate color; caudal light with a dark tip.

It is found northward to Monterey (type locality), and reaches a length of 10 inches.

218. **Starksia holderi** Lauderbach.

(Jordan and Starks, 1906; in press.)

The type from Avalon is the only specimen known.

219. **Cryptotrema corallinum** Gilbert.

(Jordan and Evermann, 1898, III, p. 2366, fig. 817.)

Known from the Santa Barbara Islands, where it was taken by the U. S. S. Albatross in thirty fathoms of water.

220. **Auchonopterus integripinnis** (Rosa Smith).

(Jordan and Evermann, 1898, III, p. 2372.)

Numerous specimens from the tide pools of Point Loma, La Jolla, and San Clemente Island. The dorsal is composed wholly of spines, as stated in the original description (Smith, 1880*a*, p. 147). The one soft ray mentioned by Jordan and Evermann is rarely present and only as a very small rudiment.

Color in life: brown on body, with more or less distinct cross-bars of darker brown; usually 2 or 3 rather bright, diffused orange cross spots on middle of side behind tip of pectoral between the dark bars. A plum-colored or brick-red area on opercles and top of head. Base of pectoral reddish, its distal half or more yellow; caudal yellowish or sometimes reddish. Small

spots on pectoral, caudal, and ventral rays, making wavy, irregular lines across fins. A black spot on posterior part of dorsal narrowly ringed with yellow, outside of which is often a dark ring. Anal brownish, with darker cross spots at regular intervals; the edge of fin margined with bright yellow. Some specimens are nearly everywhere coal black; the belly slightly lighter; the distal half of pectoral dark green; the caudal and edge of anal abruptly light red; the ocellated dorsal spot nearly obsolete.

This species is known from San Pedro to San Cristobal, Lower California.

221. **Hypsoblennius gilberti** (Jordan).

(Jordan and Evermann, 1898, III, p. 2386.)

Taken in abundance in tide pools on the ocean side of Point Loma, and at San Pedro; not found in the open bays.

The species may be known from *Hypsoblennius gentilis* by the almost straight profile of head from tip of snout to between eyes, and by the multifid tentacle over eye. The sexes do not greatly differ; the tentacle of the male is somewhat longer than that of the female, but the tentacle of the latter is much longer than in the female of *Hypsoblennius gentilis.* The two anal spines of the male are provided with fleshy tips. It is known from Santa Barbara (type locality) to Todos Santos Bay, Lower California (Smith, 1883, p. 235). It does not exceed six inches in length.

222. **Hypsoblennius gentilis** (Girard).

(Jordan and Evermann, 1898, III, p. 2387.)

Common at San Diego and San Pedro in the open bays; no specimens seen in rock pools with *Hypsoblennius gilberti.* This species may be known from *Hypsoblennius gilberti* by the rounded profile of head from tip of snout to above eyes, and by the simple fringed tentacle above each eye.

The males have the two spines of anal partly free and provided with fleshy tips, and the supraorbital tentacle long and slender. Color in life: anterior half of body and head thickly set with sharp-cut round spots of black or dark brown, narrowly separated from each other by fine olive green lines of the ground

color. On the posterior half of the body the brown color is dusky bluish, irregularly spotted and mottled with lighter slaty bluish. On the back are the beginnings of 6 or 7 faint cross bands. A faint dusky shade downward from eye and another backward; tip or lower jaw with a large, bright vermilion spot. Across lower part of head, running down from a level with mouth, are four light cross shades; the two posterior ones sharply defined and bright yellow margined with brown; the anterior ones, white and a little diffused. Anal blackish, very slightly mottled, the tips of the rays white; the swollen anterior spines flesh-colored. Pectoral light, mottled with dusky green; ventral dusky, the outer ray white; caudal yellow. Dorsals uniform, with or without a scarcely conspicuous dusky blue spot in front of spinous dorsal, or dorsals sometimes marked like body under them, though the spots on spinous dorsal are smaller and more widely spaced than those on body.

Females have a very short, simple tentacle over eye, sometimes almost absent; no small spots or reticulations on anterior part of the body and head. The light bars on under part of head are broader and blend softly with the dark interspaces. Front of spinous dorsal with a very definite dark spot.

A few males were found which much resemble females in length of supraorbital tentacles, character of bars on under side of head, and definite dark spot on front of anal.

This species is found from Monterey (type locality) to Guaymas, Mexico (Evermann & Jenkins, 1891, p. 163). It is common southward in shallow water of the open bays.

223. **Ulvicola sanctae-rosae** Gilbert and Starks.

(Jordan & Evermann, 1898, III, p. 2413.)

Known only from a single specimen collected at Santa Rosa Island.

224. **Xererpes fucorum** (Jordan and Gilbert).

(Jordan & Evermann, 1898, III, p. 2413.)

Dr. Gilbert (MS. notes) records this species from Santa Rosa and San Clemente Islands. Not before recorded south of Monterey (type locality). It is known northward to Puget Sound

(Jordan & Gilbert, 1880, p. 454). This is one of the two or three records of the occurrence of elongate blennies off the southern coast. None of the specimens have been taken in shallow water on the mainland, where they are found so abundantly northward. It is a distribution apparently parallel with that of *Blennicottus recalvus* (a species abundant in tide pools at Monterey Bay), which we did not take on the mainland, though it is common on the Coronado Islands.

225. **Chaenopsis alepidotus** (Gilbert).

(*Lucioblennius alepidotus* Jordan and Evermann, 1898, III, p. 2404.)

The adult of this species has recently been described (Jordan and Starks, 1906) from specimens collected at Avalon, Santa Catalina Island. It had previously been known from two very small specimens from the Gulf of California.

226. **Poroclinus rothrocki** Bean.

(Jordan & Evermann, 1898, III, p. 2434.)

A specimen recorded by Dr. Gilbert (MS. notes) from off San Diego. It has hitherto been known only from Bering Sea.

Family ZOARCIDÆ.

227. **Embryx crassilabris** Gilbert.

(Jordan & Evermann, 1898, III, p. 2458.)

Known from a single specimen, 12 inches long, taken off Southern California.

Family OPHIDIIDÆ.

228. **Chilara taylori** (Girard).

(Jordan & Evermann, 1898, III, p. 2489.)

Reported by Eigenmann (1892, p. 173) to be taken sometimes in San Diego Bay; not seen by us. This species reaches a length of 12 inches and is not rare in water of moderate depth north to Monterey Bay.

Family LYCODAPODIDÆ.

229. **Lycodapus fierasfer** Gilbert.

(Jordan & Evermann, 1898, III, p. 2493.)

The typical specimens from the Gulf of California, off Southern California and Washington in very deep water. Dr. Gilbert (MS. notes) records it in one station off Southern California in water shallow enough (27 fathoms) to admit it to this list.

Family MERLUCCIIDÆ.

230. **Merluccius productus** (Ayres).

HAKE.

(Jordan & Evermann, 1898, III, p. 2531, fig. 884.)

Specimens taken on lines in deep water a few miles off Point Loma. The hake or merluccio (its Italian name) is irregular in its appearance, being some years very abundant northward, and others altogether wanting. It is probably never common on the southern coast. It reaches a weight of 10 pounds, though its average weight is about half that. As a food fish it is of little value, as its flesh is very soft and watery, and it is always ragged looking when shipped. The fishermen never save it when other fish are to be had. It is exceedingly voracious, feeding on all sorts of small fishes and squids.

A specimen in the collection of Stanford University, from the Gulf of California (Albatross Station 3007) extends the range of this species southward. It ranges northward to Puget Sound (Jordan & Starks, 1895, p. 850).

Family PLEURONECTIDÆ.

231. **Lyopsetta exilis** (Jordan and Gilbert).

(Jordan & Evermann, 1898, III, p. 2612.)

Two specimens taken off San Pedro. It ranges northward to Puget Sound (Jordan & Starks, 1895, p. 851), is abundant about San Francisco, and is known southward to San Diego (Gilbert, MS. notes). It does not exceed a foot in length, and is of little value as a food fish.

232. **Eopsetta jordani** (Lockington).

ENGLISH SOLE.

(Jordan & Evermann, 1898, III, p. 2613.)

Once recorded from San Diego by Eigenmann (1890, p. 23). North of Monterey this is an abundant and important species; reaching a length of 20 inches. As a food fish it is considered one of the best of the flounders. Great numbers are dried yearly by the Chinese. It ranges northward to Puget Sound (Jordan & Starks, 1895, p. 850.) Its common name "English sole" is doubly unforunate, as it is not a sole, and is not found in England.

233. **Hippoglossina stomata** Eigenmann and Eigenmann.

(Jordan & Evermann, 1898, III, p. 2620.)

The typical specimens taken in deep water off San Diego. Dr. Gilbert (MS. notes) records it from numerous localities from off the southern part of Lower California north to Point Conception. It is apparently not rare in deep water.

234. **Xystreurys liolepis** Jordan and Gilbert.

(Jordan & Evermann, 1898, III, p. 2623.)

Specimens from San Pedro. This species reaches a length of 15 inches and is rather common on the Southern California coast. It ranges from Santa Barbara (type locality) to the Gulf of California (Gilbert, MS. notes). It has not been before recorded so far south.

235. **Paralichthys californicus** (Ayers).

(Jordan & Evermann, 1898, III, p. 2625.)

The "halibut" of Southern California; a food fish of importance. The young is the commonest flat fish on the beaches of San Diego Bay. It reaches a weight of 60 pounds and a length of 3 feet. Known from San Francisco (type locality) to the head of the Gulf of California (Gilbert, MS. notes).

236. **Pleuronichthys verticalis** Jordan and Gilbert.

(Jordan & Evermann, 1898, III, p. 2638.)

Not rare in San Diego Bay; hitherto unrecorded this far south. It is not very common; ranging north to San Francisco (the type locality). It may be known from *Pleuronichthys cœnosus* by the higher, sharper interorbital space, with a higher, sharper spine at its posterior end. The records of *Pleuronichthys cœnosus* south of Point Conception probably refer to either this species or to *Pleuronichthys ritteri.*

237. **Pleuronichthys ritteri,** sp. nov.

Head 4⅕ in body to base of caudal; depth 1⅞. Upper orbit 3 in head; maxillary 4; pectoral of colored side 1⅗; highest dorsal ray 1½; highest anal ray 1½; caudal 1. Dorsal ray 66; anal rays 48. Scale in a longitudinal series above lateral line 78.

Ventral outline of body forming a nearly straight line from front of anal to tip of mandible; head pointed. Interorbital ridge low and sharp, ending posteriorly in a short conical spine turned slightly downward; a small tubercle on posterior margin of upper orbit; and two at anterior margin of lower orbit, the upper of which is the larger. A cutaneous fold on blind side close behind angle of mouth. Teeth present in bands on blind side of both jaws, and a narrow band on eyed side of lower jaw. Gill rakers 5 + 11.

Origin of dorsal on a level with anterior margin of maxillary; the first two rays below the level of upper nostril. Origin of anal slightly behind vertical from base of pectoral. Pectoral of blind side ⅔ as long as its mate; ventral of blind side slightly longer than its mate, and a little farther forward; caudal rounded. Scales small, cycloid, imbedded, and not imbricated anteriorly. Accessory branch of lateral line ending under thirty-forth dorsal ray.

Ground color in spirits grayish brown; light spots as large as pupil scattered over body and head; an indefinite dark spot slightly larger than pupil on lateral line midway between tip of snout and base of caudal; a larger spot under base of posterior fifth of dorsal and a similar one opposite it at base of anal. Dor-

sal and anal fins light, somewhat mottled with large blotches of darker brown; the shades blending into each other. Caudal mottled; a light spot on each side of base; a light bar across middle; its posterior half darker. Pectoral crossed by 3 light bars, the last bordering the fin. Edge of shoulder girdle dark below pectoral.

The above description is of the type, 6¼ inches in total length. Other specimens show the following variations: Head 4 to 4¾; depth 1⅘ to 1⅞. Dorsal 62 to 68; anal 46 to 48; scales 77 to 83; gill rakers 3 to 5 + 9 to 11. The dark spots may be indistinctly ocellated; the light spots may be absent. A small specimen has the entire body peppered with black, no light spots, and a black spot at posterior end of dorsal and anal.

This species may be known from *Pleuronichthys verticalis* by the shorter spines and tubercles on head, and the lower interorbital ridge not reaching to end of snout. From *Pleuronichthys cœnosus* by the more elongated head, the snout not continuous with dorsal outline, the presence of two anterior tubercles, and by the tendency of the posterior spine of interorbital to turn downward.

The type of this species was taken in San Diego Bay; it is numbered 9786 in the Stanford University collections. Cotypes were taken at the same locality, and at San Pedro.

We take pleasure in naming this species for Dr. W. E. Ritter, Scientific Director of the Marine Biological Station of San Diego.

238. **Pleuronichthys decurrens** Jordan and Gilbert.

(Jordan and Evermann, 1898, III, p. 2637.)

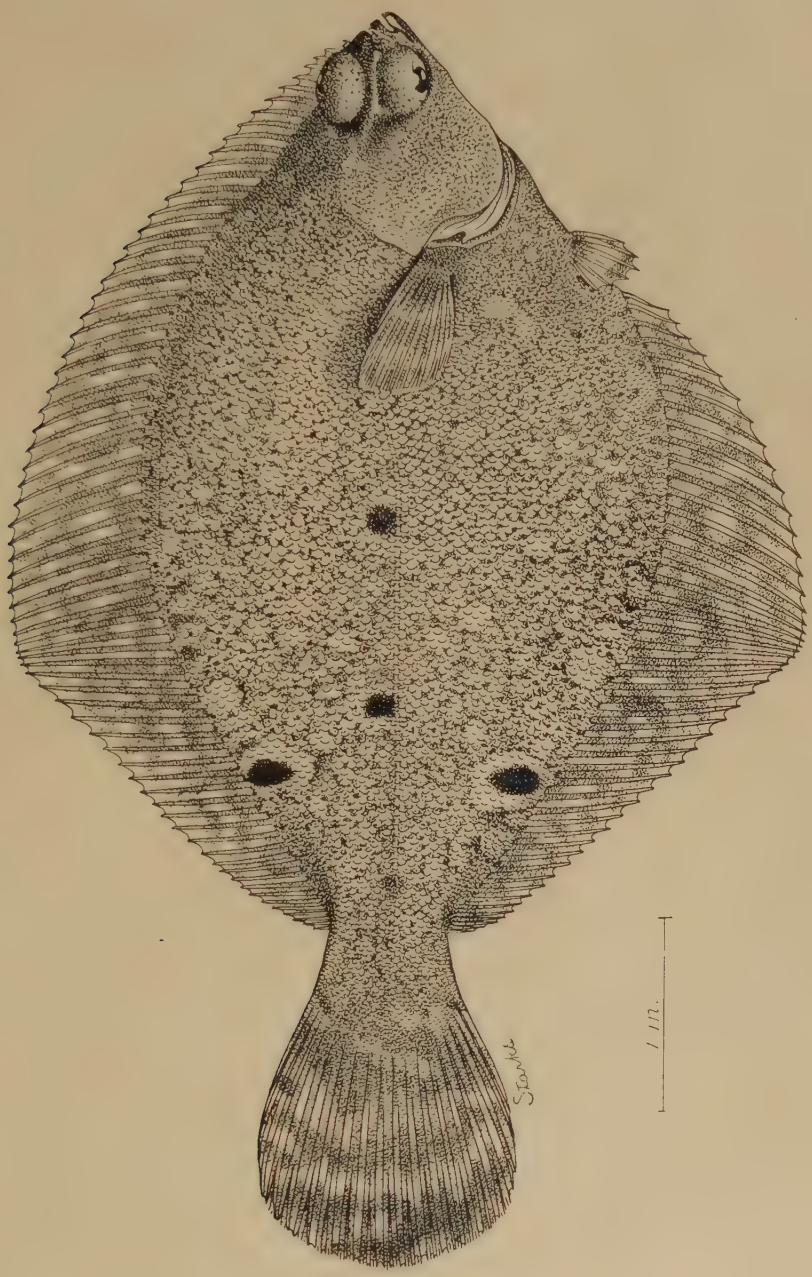
Known from San Francisco to the Santa Barbara Islands (Gilbert, MS. notes); hitherto unrecorded from Southern California. It may be readily known from other species of *Pleuronichthys* by the front of the dorsal extending farther down on the blind side of the head.

239. **Hypsopsetta guttulata** (Girard).

DIAMOND FLOUNDER.

(Jordan and Evermann, 1898, III, p. 2639.)

A common flounder on the shoal beaches of San Diego and



Pleuronichthys ritteri Starks and Morris, new species.
Drawn from the type from San Diego, by Chloe Lesley Starks.

San Pedro bays. Color in life: brown with round bluish spots scattered sparsely over the body, and arranged in more or less definite rows. A row of 3 or 4 along the lateral line at wide intervals; an arched row of 10 or 15 midway between lateral line and back, and a similar row between lateral line and ventral outline. Sometimes a few light spots and a row of obscure dark spots, or sometimes rings at base of dorsal and anal. Other specimens have the spots more scattered over the body; the spots do not show in preserved specimens.

This flounder is a food fish of fair quality; it is one of the common species in the shoal waters from Tomales Bay (type locality) to the head of the Gulf of California (Gilbert, MS. notes).

240. **Parophrys vetulus** Girard.

(Jordan and Evermann, 1898, III, p. 2640.)

Specimens from San Pedro. This flounder is found in great abundance; it lives in water of moderate depths and never reaches a large size. It is known from Alaska (Jordan, 1884, p. 185) to San Diego (Gilbert, MS. notes).

241. **Microstomus pacificus** (Lockington).

(Jordan and Evermann, 1898, III, p. 2655.)

Many adult specimens taken off San Pedro. A specimen 2¼ inches in length is apparently the young of this species. The eyes are symmetrical, one on each side of head. The head is small, contained six times in total length to base of caudal. The eyes and mouth much smaller than in the adult, though of about the same size in relation to the size of the head. Sharp recurved teeth are present on both sides of jaws. The number of dorsal and anal rays and vertebrae are the same as in the adult. The color is the same on both sides of the body, very pale with a row of dark brown spots on median line from above base of pectoral to base of caudal; those nearest head smaller and less distinct.

Specimens having all of the characters of the adult with the eyes and color on one side, are no longer, but have the body thicker and deeper; the head larger, 3½ times in body to base of

caudal; the eye larger; and broad incisor-like teeth on blind side only.

This species is hitherto unrecorded south of Monterey; it ranges northward to Unalaska (Gilbert, 1893, p. 460) and southward to San Diego (Gilbert, MS. notes). It is common in deep water and does not exceed a pound in weight.

242. **Glyptocephalus zachirus** Lockington.

(Jordan and Evermann, 1898, I, p. 2658.)

Records by Dr. Gilbert (MS. notes) extend the range of this species southward to Southern California. It is common northward to Bering Sea (Gilbert, 1893, p. 460).

243. **Citharichthys sordidus** (Girard).

(Jordan and Evermann, 1898, III, p. 2679, fig. 943.)

This flounder is very common in waters of moderate depths from British Columbia (Bean, 1884, p. 353) to Cerros Island, Lower California (Gilbert, MS. notes). It rarely exceeds two pounds in weight.

244. **Citharichthys stigmaeus** Jordan and Gilbert.

(Jordan and Evermann, 1898, III, p. 2681.)

Specimens from San Diego and San Pedro. They agree with the description of the type (Jordan and Gilbert, 1892, p. 411) in most respects, but have from 59 to 62 pores in the lateral line (not 54), and have scales on the posterior part of the interorbital ridge. A specimen taken by the U. S. S. Albatross off the coast of Oregon agrees with our specimens in these respects.

This species may be known from *Citharichthys sordidus* in having a sharp interorbital space. It is found in deep water from San Diego to Oregon, and is rather rare.

Family SOLEIDÆ.

245. **Symphurus atricaudus** (Jordan and Gilbert.

SAN DIEGO SOLE.

(Jordan and Evermann, 1898, III, p. 2707.)

Specimens taken by the aid of a trawl in abundance outside of San Diego Bay in about fifty fathoms. It probably seldom runs into shallow water, as it is unknown to the seine fishermen. It is known to the Gulf of California (Gilbert, MS. notes).

Family ANTENNARIIDÆ.

246. **Antennarius avalonis** Jordan and Starks.

(Jordan and Starks, 1906; in press.)

This species is known from the type 13½ inches in length from Avalon, Santa Catalina Island.

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